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GAS

29th Year of Publication

DECEMBER 1953 • VOLUME XXIX • NUMBER 12

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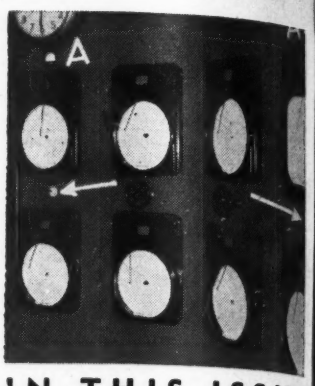

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By the use of push buttons (arrows), Public Service Co. of Colorado can coordinate pressures in several interconnected regulator stations simultaneously (see pages 33-35).

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Thermally Thinking

SPOT NEWS AND COMMENT ON GAS INDUSTRY AFFAIRS

PR men select Belden

Official recognition of NEGA's widely respected public relations policies has come in the form of the election of Managing Director Clark Belden to the office of eastern regional v.p. of the Public Relations Society of America.

Equitable Gas buys Texas reserves

Another eastern utility, apparently taking its cut from Columbia Gas System, has dickered for its own reserves at the source. Equitable Gas Co., Pittsburgh, has contracted for gas from the Flour Bluff fields in Nueces county, Texas, and has arranged for Tennessee Gas to carry it. TGT will spend $9.3 million to add 23,000 hp to its existing booster stations and add 50 miles of 10-in. laterals. Initial deliveries of 9750 Mcf would be increased to 24,375 Mcf by Dec. 1, 1956.

It's Vancouver for PCGA

Its extreme popularity has forced Victoria, B. C., to bow out as the locale for PCGA's 1954 convention. Too many reservations and not enough hotel space have forced it off the calendar in favor of its big sister, Vancouver. PCGA officials had thought Victoria's remoteness would cut attendance low; not so, not so.

TGT bids for New York market

Tennessee Gas has cooked up a scheme to enable it to enter the New York City-Philadelphia market en route to New England. Transco will fight. (For details, see Pipeline section.)

No quick decision of Texas tax

The Supreme Court has refused to grant the request of Texas attorney general, John Ben Shepperd, to move the test case on the pipeline tax ahead of other court business. The highly important case is set up for January.

GAMA reaffirms "no-exposition" decree

The appliance manufacturers have finally announced their decision, agreed upon at their closed meetings held in conjunction with AGA's St. Louis convention, reaffirming their previous stand against a 1954 Atlantic City show. GAMA had agreed to reconsider its original decision, made at its annual meeting last spring, but the judgment stood.

Range Shipments lagged again

Domestic models failed by 10% to equal October 1952's peak, so for the first 10 months of this year hold only a scant 4.8% margin over 1952. Nonetheless, October (traditionally a peak month) was the second best month of the year, with 215,800 shipped. Water heater movements were a disappointing 6% ahead of October 1952, although for the year to date, 1953 is still 17.8% ahead.

Gas on the air conditioning bandwagon

Servel's sales volume on all-year air conditioners and heavy-duty water chillers is already more than 100% of 1952 figures. One reason for the sensational gains is the swing of speculative home builders to air conditioning. Servel is putting 700 in a single project, Little Rock's widely heralded "Broadmoor" homes.

Rebirth of Spraberry

The mammoth Texas producing field will soon come to life, following more than a half-year's enforced idleness. The Texas Railroad Commission, which ordered it shut in April, because of excessive flaring, may reopen it now that Permian Basin Pipeline Co. and Northern Natural are nearing completion of their two projects designed to utilize the gas. It was estimated 220 MMcf, valued at 30 cents (including liquid hydrocarbons it contained), was being burned before the shutdown was ordered.

An Eye on the Capital

FPC's getting down to "cases"

The biggest single story in Washington today—from the standpoint of the natural gas industry—is that the Federal Power Commission is proceeding to get down to cases, particularly on procedures to speed up rate cases, and that the industry can feel that it faces an impartial group when it attempts to persuade the Eisenhower appointees to give it a break.

This is not to say that the industry can feel that it has a "friend in court" in the new appointees, for these new men seem to be determined not to be subject to pressure from either misguided "consumer" groups or from over-zealous company attorneys.

FPC Chairman Jerome Kuykendall, in a featured address before the 35th annual convention of the American Gas Assn. at St. Louis, underscored this policy of fairness that is being followed by the commission majority when he assured the industry that the agency intended to be fair both to the utility investor and to the utility customer.

Mr. Kuykendall met head-on the complaints which frequently are aired in labor and "consumer" newspapers about the failure of regulatory agencies "to stem the inflationary tide." He declared that the FPC "has no authority to

Thermally Thinking

compel a utility under its jurisdiction to absorb the additional expenses brought about by inflation and to render the customer immune from them." He pointed out that this would be no more sensible or just than the freezing of farm prices at a level designed to impoverish the farmer. (For a more comprehensive report on Mr. Kuykendall's talk, turn to page 49.)

Mr. Kuykendall has emphasized his independence of both the industry and of pressure from the so-called "consumer" interests in speech after speech in recent days, making it plain that he and his co-workers are not to be considered either for or against any plan except that of seeing to it that various segments of the society, including investors, are protected against injustice, insofar as the FPC is concerned.

A new kind of "Big Inch"

The Wall Street Journal to the contrary notwithstanding, Petroleum Administration for Defense has no scheme mapped out—yet—to build one pipeline, or more than one pipeline, from Louisiana, Ohio, or any other location, to the East coast area to be converted to oil transport in case of war.

What *is* under study — and it has been under study for many, many months, and may be for many more before there is action — is how to solve transport problems that could arise quickly in case of a major war, namely, a war with Soviet Russia.

The PAD planners have posed the problem in this way: How can some plan be worked out so that oil tankers who now ply the Gulf Coast-Atlantic Coast area may be released for other duties in case of a war. Literally hundreds, and possibly thousands, of these tankers now transport oil from Louisiana and Texas to the East coast. In case of war, a large share of these would be needed for other tasks in the highly-important industrial area lying along the Atlantic seaboard from Boston to Baltimore.

One plan, considered and discarded, was for Uncle Sam to build an oil pipeline in advance and maintain it in standby condition. Another plan, also considered and discarded, was to buy the pipe and other equipment needed, to place it along the projected route, and to keep it ready to be placed in case of the need.

Then, PAD planners let the gas and oil industry in on their problem, and the idea has been broached to build two pipelines—one from Texas up to New York, and the other from Ohio to Philadelphia, or roughly following those paths. These would be gas lines, to be converted to oil.

Yet, other problems have come into consideration. There is doubt that a gas operating company would want to lease lines that could be taken away from it on a moment's notice. Also, what would happen to the customers, in case the gas line had to become an oil line figuratively overnight? There's no thought — as the *WSJ* erroneously stated — that industries would store gas against such a contingency. But there is a thought that, if the underground storage pools could be found, the gas companies might store the gas for use in case their line were to be converted.

Cost-of-money upheld

The 10th U. S. Circuit Court of Appeals has upheld the Federal Power Commission with respect to all but one of the points raised by the Colorado Interstate Gas Co. in appealing from an FPC opinion of 1952 which cut natural gas wholesale rates.

In only one particular—the refusal of the FPC to take into consideration losses from gasoline operations in determining the cost of natural gas service —was the FPC's order reversed by the court. On this point, the case was remanded for further proceedings in accord with the view of the court.

Attorneys for Colorado Interstate had made a determined attack on the commission's allowance of a 5¾% rate of return based on the comparative cost of capital of gas companies subject to the FPC's jurisdiction. The court did not endorse the 5¾% return specifically. It stated that this was "lower than any rate heretofore established which has been called to our attention." However, the opinion of the judge writing the decision added: "From the record, we cannot say that a rate of return of 5¾% properly computed is unreasonable and therefore confiscatory."

In regard to the company's contention that the FPC's cost of capital data were too narrowly based and did not reflect accurately the company's requirements in the matter of attracting capital, the court stated:

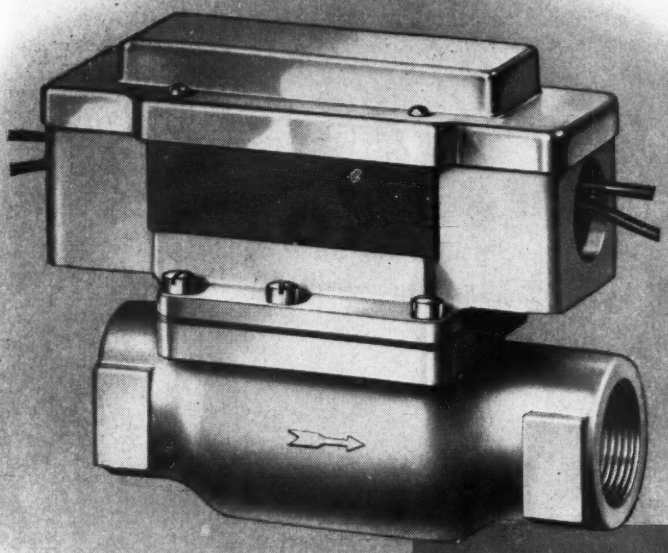
"We believe that the experience of other comparable gas utility companies, having a sound financial structure and long experience of successful operation, is a better criterion by which to gauge and determine the adequacy and fairness of rate of return than that of railroads, power transmission companies, or other like utilities engaged in other fields and under other conditions and circumstances, or the rate of return on government bonds or industrial bonds in unrelated enterprises.

"We do not say that such factors are not proper for consideration, but on the other hand failure to give them weighty consideration does not in our opinion constitute reversible error on the record before us in light of the factors that were considered in this case."

Regarding the application of the comparative cost of capital data actually used by FPC in the case, the court stated:

> "From an objective study of the investor's appraisal of the common stock of nine natural gas companies held by the public during the five-year period ending August 1951, the commission found that investors had required a return on the average on the issues sold to the public of 8.3%. Colorado calls attention to the fact that the exhibit reflecting this study does not contain the names of these companies nor do their names appear in the record. They are, however, the nine gas companies reporting to the FPC and it is not contended the information reflected in the exhibit is not correct or that Colorado did not in fact know or could not ascertain which companies were included in the study.
>
> "The commission further found . . . the average earnings-price ratio of the outstanding common stock of seven natural gas companies traded on recognized exchanges for the same period to be 8.2%, with the average for the last 12

Continued on page 74



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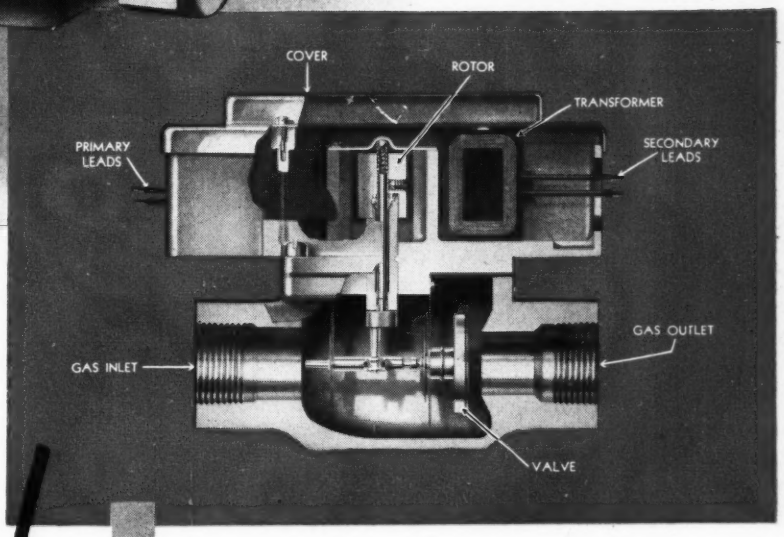

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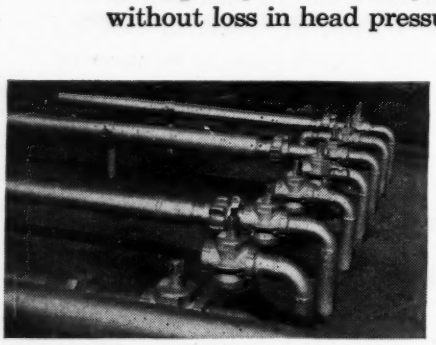
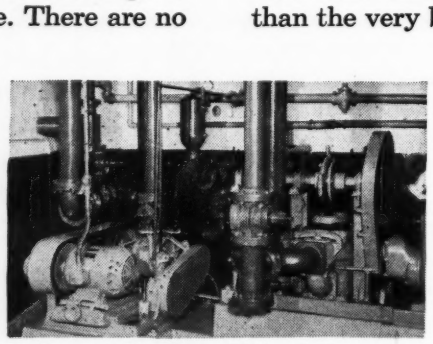


The Petroleum Industry finds full-pipe area of a.c.f. Valves of great advantage on both natural gas and crude oil.



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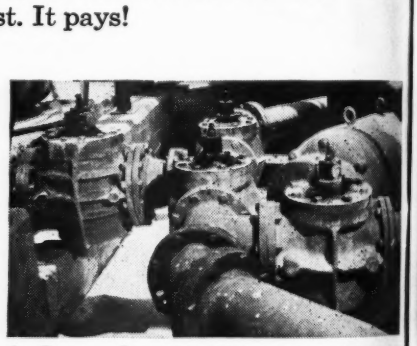

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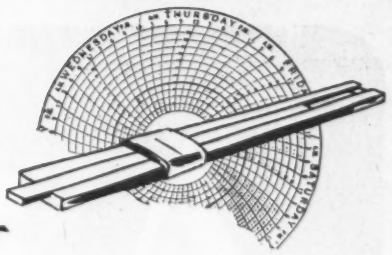

• By GUY CORFIELD

Go north, young man, go north

For the past many years one of the regular exports from Canada to the United States has been technical college graduates. It seems possible now that this trend may be stemmed and soon even reversed, as Canada develops her north central and northern petroleum resources that are causing such a sensation in the oil industry, and keen interest in the northwestern gas industry, and provoking such headlines as "Alberta—Another Texas?"

The direct activity in the Alberta area, including millions of dollars invested in petrochemical and related industry, is already having a profound effect on the West Coast on both sides of the border, as the Transmountain oil line from Edmonton prepares to deliver oil to the new and enlarged western refineries. In Canada, Royalite Oil Co. is building a 5000-bbl refinery at Kamloops, Standard of California is constructing an 11,000-bbl plant adjacent to its existing 8350-bbl refinery at Burnaby, Imperial Oil Co. is increasing its present plant at Ioco from 12,000 to 34,000 bbls, and Shell Oil is doubling the capacity of its 7000-bbl refinery at Shellburn; on the U. S. side of the boundary, Shell Oil Co. is planning a 50,000-bbl refinery at Anacortes, General Petroleum has a 10,000-bbl plant building at Ferndale, and Pacific Oil & Refining will have a 10,000-bbl refinery in Seattle. What a field all this will be for technical talent!

And the activity is not confined to the West, having already spread to the northern edge of the Great Lakes through the operation of a crude oil line from Edmonton to Superior, Wis. The active center of this area is Sarnia, across the St. Clair river from Port Huron. Sarnia now receives its oil by tanker from Superior, but by 1954 will obtain it direct through a 625-mile extension of this oil line. The Lake tankers will then distribute refined products, and a product line is also planned to Toronto 188 miles east. Eighty million dollars was spent in new plants in the Sarnia area in 1952, and the development is continuing rapidly. The major operators include Imperial Oil (71,000-bbl oil refinery); Sun Oil Co. (15,000 bbls); Canadian Oil Co.; Polymer Corp. (fully integrated synthetic rubber plant); Cabot Carbon of Canada; Dow Chemical of Canada; and Fiberglas Canada.

All this activity would seem to have many points of interest to the gas industry. As suggested, engineers and chemists, already scarce, will undoubtedly be attracted across the border. Fuel oil will be more plentiful. And, reviewing past industry development across the United States, it seems safe to submit another modified quotation to the effect that "If Oil Comes, Can Natural Gas be Far Behind?"

Heat-insulating LPG tanks

The development of an effective coating to insulate aboveground LPG tanks from the heat of an adjacent fire has been announced by the refractories division of the Babcock & Wilcox Co. This coating is a lightweight insulating concrete consisting of a kaolin base with a hydraulic setting cement binder, applied with a cement gun to a thickness of 1½ in. Preliminary treatment of the outside of the tank consists of applications of a corrosion resistant paint and then 2-in. mesh galvanized wire reinforcement held in place with metal straps and clips. Finally, when the concrete has dried, it is sprayed with a waterproof coating.

Tests indicate that the steel shell of a tank coated with this insulation, when subjected to an external temperature of 1800° F will not rise above 400° F in a 2-hour period; and that when so heated, the coating can withstand the impact and sudden cooling of a fire hose stream without any deterioration.

Industrial TV

While television has become almost a household necessity in the many areas where reception is now available, for both entertainment and educational purposes, it may not be realized that it also has an increasing use in industry for centralized or remote observation of instruments, processes, production lines, etc.

In general, the difference between regular and industrial equipment is that the latter uses a cathode tube that is more rugged and will last longer and with a minimum of adjustment under severe operating conditions; the signals are transmitted over closed coaxial cables direct to the viewing screen with immunity from outside interference, static, etc., and minimum of distortion; and the picture can be in color with a 3-dimensional effect which produces sharper definition and clearer observation.

Cameras have been developed so compact as to be about the size of a portable typewriter case, and can be used with any standard VHF television receiver by plugging the unit into a standard wall socket and attaching the output cable to the receiver and, in fact, multiple receivers can be connected at distances up to 2000 ft.

Such equipment has been found advantageous to cut production costs, reduce accidents, promote operating efficiencies, etc. For example, in a steel mill it has been used for coordination of heating, rolling and other interdependent operations and also for viewing heats for color; in research it can afford the opportunity to observe dangerous operations or experiments where the human eye cannot or should not be exposed; and in a factory, a supervisor or executive can observe production or quality control at critical locations from a central and secluded point of vision.

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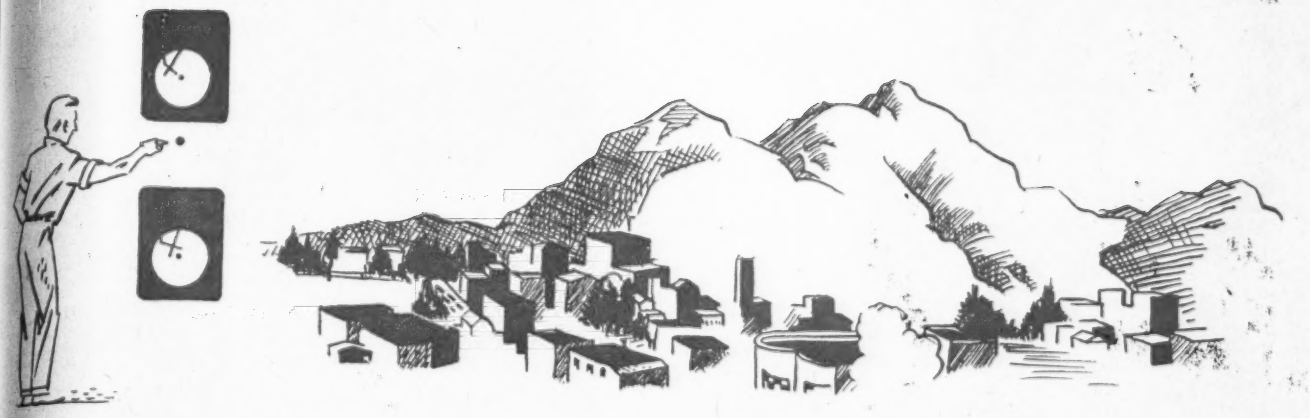


Push-button controls Denver's gas pressure

By **EVERETT M. ROARK** · Public Service Co. of Colorado, Denver

THE postwar natural gas picture in Denver, like many other aspects of the city's phenomenal growth, presented demanding and perplexing problems to those individuals interested in giving good service to the customers. Never before had there been such pressure to procure and supply the gas that was in such demand by fast-developing residential neighborhoods and the furnaces of industry which had found it desirable to locate in this area.

Capacity doubled

As a supplement to Colorado Interstate Gas Co.'s Amarillo pipeline, the Hugoton gas field was tapped by a 20-in. line which eventually led gas into the city mains of Denver, doubling the capacity to serve the area. Currently, construction is under way which will effect completion of a third Colorado Interstate supply line into our load areas.

There had been plenty of advertisement pushing the use of natural gas as a househeating fuel. The success of this promotional activity, which was considerably aided and abetted by the fact that natural gas at our rates was, and is, the cheapest fuel available in the area, is shown by the statistics of growth in the past few years.

Coincident with all the usual problems of growth was the matter of properly controlling the city's distribution main pressures in a fast changing system. Because of the nature of the Denver low pressure gas distribution system, the familiar weight-loaded governor was called upon to do a job of pressure control that was beyond its ability to deliver. The main system, a Doherty design, utilizes the mains by working them strenuously with rather steep pressure gradients, thus allowing the use of smaller main sizes in a well-designed system. This factor calls for automatically increased station delivery pressures over a wide range above minimums during the peak load periods in order to overcome the inherent pressure drops as the gas flows to the ends of the system.

It should be pointed out here that practice in this company has been to supply a load area by relatively few district regulator stations of large capacity housed in aboveground structures. For example, in the load area supplied by stations now operated by the method described later herein, there are seven district regulators controlled from one master station, and the aggregate peak-hour load of these stations amounted to about 5 MMcfh during the last heating season. The dependency of so much load upon the operation of seven district regulators produced sufficient justification for round-the-clock manual operation of four of these stations prior to the adoption of the remote control. Similarly, the magnitude of load being served economically justified the expenditure of monev in investment and operation to install the remotely controlled equipment.

Due to greatly increased heating loads and the resultant higher peak demand pressures, this old, weight-loaded automatic system found itself getting into more and more potential and active troubles as the load trend continued.

We began to experiment with more refined systems of automatically controlling station pressures. After some adaptation, a commercially manufactured pressure controller was found. About 50 of these instruments were installed in stations in the Denver area and surrounding towns, and they have served their purpose well except in those areas where two or more stations supply a common system.

Adjacent stations affected

What about the push button? We were not entirely satisfied with the pressure and load balance in those distribution mains that are interconnected in a system served by several large regulators. Installation of large diameter mains interconnecting stations supplying a common area had progressed to such an extent that independent pressure conditions at one station were adversely affecting adjacent stations. Each automatic station was an individual and, of course, would not coordinate its behavior with the other individual stations. It was concluded that in order to achieve optimum distribution conditions in such areas, a coordinating control was necessary and it was recognized that this control would have system problems to solve which required the elements of a robot mind.

The problem was tossed to three of us

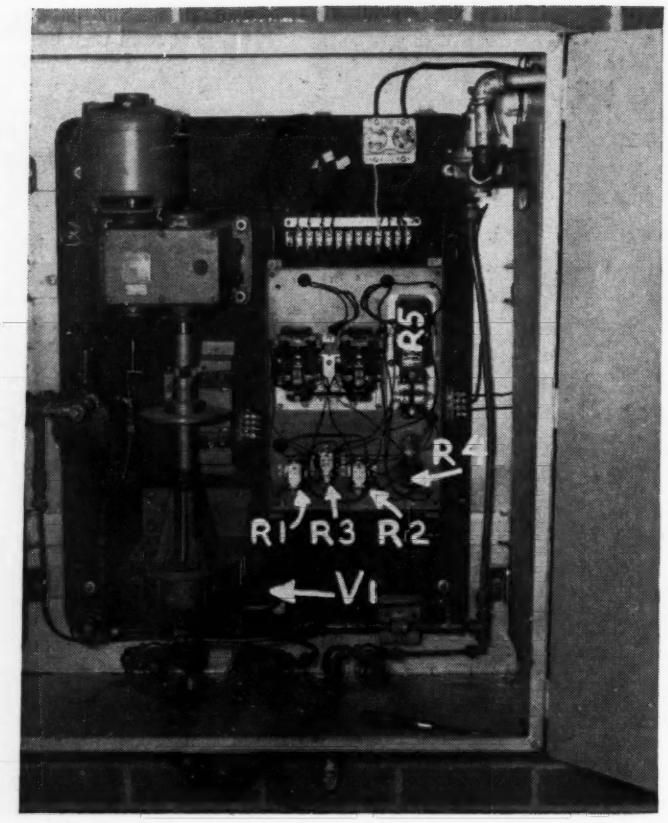


Fig. 1. Loading equipment installed in metal housing on outside wall of remote station building.

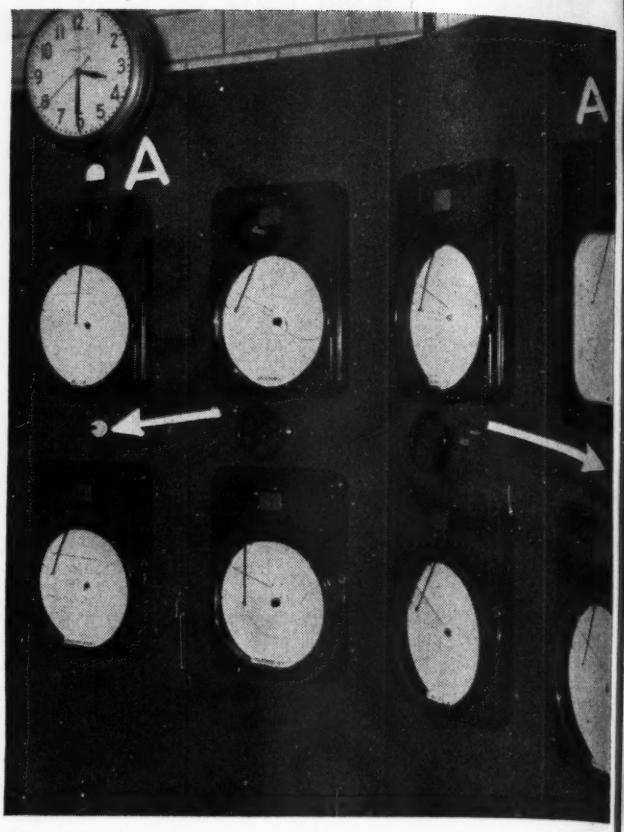


Fig. 3. Portion of master station panel showing control buttons for two remote stations.

in the engineering department with the following specifications:

(a) Devise a system operated by leased telephone wire to raise and lower the set pressure at each of the remote stations from a central master control point.

(b) Provide a means of indicating at the master control point the pressure conditions at the remote station.

(c) Provide a "fail-safe" arrangement such that in case of electric power failure in the affected districts, the control would automatically raise that remote station outlet pressure to a safe and adequate level in order to assure continuity of service to loads of high heating saturation and the resulting load surge that would occur with the simultaneous energizing of thermostats in the outage area.

(d) Provide a fail-safe arrangement that would automatically raise the affected remote station when its linking control wires are inoperative.

Selected system

With these instructions we went to work. Many kinds of devices can be arranged to operate a remotely located electric motor or some other power device. We chose a very straightforward system using a reversible electric motor and worm reduction gear at the remote station. This worm gear simply spring loaded and unloaded a pilot regulator controlling the station regulator which is pressure loaded *(Fig. 1)*. A common telemetering system, a standard item already in use, was the pressure indicating mechanism. The most challenging problem was to satisfy (c) and (d) in the above requirements. No system was considered satisfactory unless it was highly reliable under any condition to which it might be subjected, yet it had to be simple enough so that specialists would not be needed for its maintenance and operation.

After several weeks of work, a promising circuit finally evolved which we promptly set up in the laboratory on a breadboard. Several component parts, such as standard sensitive relays, had to prove they were adaptable in the circuit. Certain voltage, frequency, and current limitations were imposed as standards of regulation by the local telephone company.

The sketch *(Fig. 2)* shows the scheme of connecting the parts. R1, R2 and R3 are Potter and Brumfield sensitive relays, R4 is an Amperite 115 C10 relay with delayed contact opening upon energizing, and R5 is an Allen Bradley No. 849 time delay relay arranged to delay contact opening upon discontinuance of energy to its coil. S1 is a lever type normally neutral, double-pole double-throw control switch used to raise and lower the remote station outlet pressure.

Supervisory current

R1 and R2 are adjusted to close on about 20 mils current each and R3 on about 7. With S2, R3, R4 and R5 closed, Z is adjusted so that the milliameter, A, reads 13 mils. This current is called the bleed or supervisory current which traverses the entire connected system, two-thirds going through and closing R3 and one-third passing through R1 and R2 but not altering their position. When the control switch, S1, is in the "raise" position, Z is shorted out allowing the full d.c. voltage to be impressed upon R2, R1 being grounded at both ends of the line and thus inoperative. The contacts of R2 energize the "raise" coil of the motor power relay and the control pressure is changed on the remote loading system. If S1 is moved to the "lower" position, the reverse sequence is initiated, which results in a lowered pressure at the remote station.

This circuit was devised to utilize the ever-present supervisory current as a watchdog on the condition of the telephone pair. If the supervisory current is disrupted by failure either of the tele-

phone pair or master station power, R3 falls open and deenergizes R5 and V1. V1 is a solenoid gas valve controlling emergency loading pressure. If the disruption of the supervisory current is momentary, lasting less than 10 seconds, R5 and V1 will pick up and operate normally. If the disturbance lasts more than 10 seconds, the contacts of R5 drop open and prevent R3 from closing, which "locks" V1 in the open and deenergized position, causing the emergency loading pressure to take over the station. This pressure will build gradually to fixed limits if there is no intervention by the operator. The arrangement is an assurance that inconsequential momentary flickers of 115-V power will not trip the emergency loading mechanism, yet, if a continuous lapse of 10 seconds occurs, real trouble is anticipated and the remote station is set on emergency pressures. This emergency pressure will prevail until the failure is remedied or until personnel can manually control the station.

Remote station "locked"

In case of ordinary district electric outages, R5 relaxes and V1 immediately falls open. If the duration is more than 10 seconds, the remote station is "locked" on its emergency pressure apparatus. When the district power is restored, the remote station remains on emergency pressure at the will of the operator at the master control point. If the operator desires to regain control after the power at the remote station is resumed, he can open S2 on his control panel and run his normal loading apparatus up to the pressure to which the remote station has built, then close S2 and momentarily push his "raise" button again. This action enables him to furnish a ground from a motor relay contact to R5, energizing it and closing its contacts, which action closes R3 which in turn furnishes the normal ground path that powers R5 and V1. V1 closes and the emergency loading pressure bleeds off into the gas system. Then the operator is back in normal control to adjust his pressures.

R4 is another accessory to the circuit which adds to the safety of operation. R4 is a heater type time delay relay which times the duration the power is connected to the control motor terminals. If power is continuous for more than 10 seconds, trouble is assumed and R4 opens the circuit to R3 which initiates the emergency pressure apparatus.

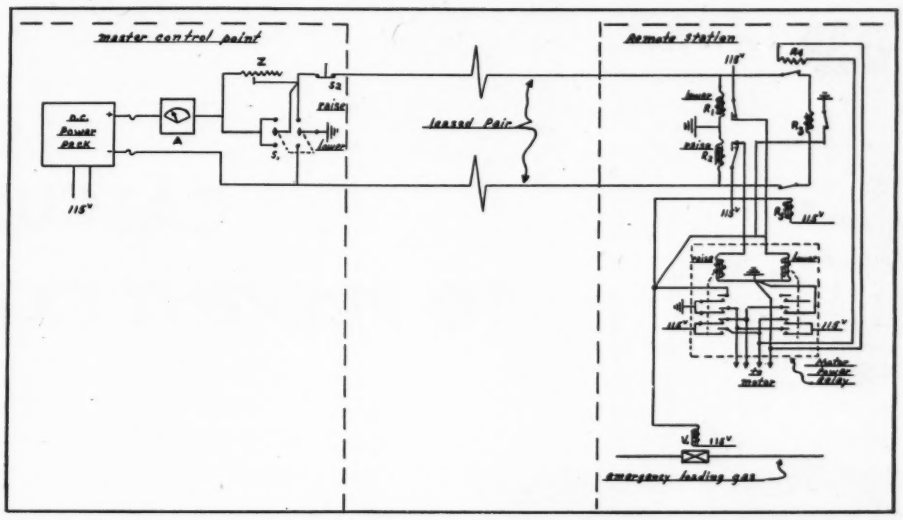


Fig. 2. Schematic drawing of regulator station remote control.

Source of information

Experience has shown us that the permanently installed milliameter, A *(Fig. 3)*, is a source of information. If A is indicating a normal supervisory current of 13 mils, the control system can be considered in normal condition. If A shows no reading, the operator knows he has either local power trouble or telephone line trouble. A reading of nine mils on A indicates that R3 at the remote station is out of the circuit. This would indicate electric outage at the remote station. He could verify this by checking his telemetering receiver from that station. If it, too, were inoperative, he can assume 115-volt power outage at the remote station. By the same token, he can detect when the power resumes at the remote station by noting that his telemetering receiver immediately records the emergency outlet pressure of the remote station.

The general plan in the Denver city gas distribution system is to form three master control centers. We are apprehensive about combining the control for the whole in one central location for obvious reasons.

Master control functioning

One of these master control points is already installed and in operation *(Fig. 3)*. This station operator has seven station outlets at his control, five of these being remote stations varying from two to three and one-half miles distance. The operator surveys from a central desk, a semicircular control panel with a double row of recorders. The "raise" and "lower" buttons *(see arrows in Fig. 3)* are installed in a console on the desk and the other on the panel.

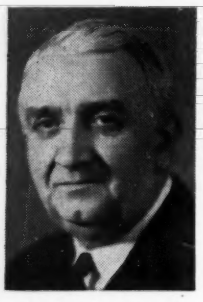
As experience has been gained through operation, it has shown that this type of control has considerable merit. The human element, which can supervise and improve, has been combined with a mechanical conglomeration of controls, which in themselves, no matter how well constructed, are subject to maladjustment, malfunction, and failure.

As has been previously mentioned and described, the control system is so devised that any malfunction or failure in these portions of the equipment will normally result in "fail-safe" action. However, troubles in certain other portions of equipment, the remote station regulator for example, can usually be detected by the operator in sufficient time to summon help and dispatch it to the affected station.

Mr. Roark, a native of Pittsburg, Texas, attended Centenary College in Shreveport before graduating with a B.S. in physics from Denver University. He has been with Public Service of Colorado since 1948 and at present is a pressure control engineer.

GAS exclusive

CALCULATION OF HEAQU
TO PREVENT EXTERNAL FREEZIN PI



By T. H. KERR and E. E. SMITH
Ohio State University, Columbus

Mr. Kerr, a graduate of Carnegie Institute of Technology, retired as vice president, chief engineer, and a director of the Ohio Fuel Gas Co. in 1943 after 30 years of service. Since then he developed the fuel testing laboratory at Ohio State where he is an associate professor.

Dr. Smith holds bachelor, master, and doctor of philosophy degrees in chemical engineering from Ohio State, where he is an assistant professor. Since 1949 he has been a member of the fuels research laboratory, engineering experiment station and on the staff of the chemical engineering department at the university.

1. Problems arising from changes of pressure in gas systems

THE problems arising from thermodynamic changes in natural gas under pressure evidence themselves first in connection with the design and operation of compressor stations. The compression of natural gas as an aid to its transmission dates back to the 1890's. When it was necessary to employ two stages of compression, intercoolers were found necessary or advisable in order to increase efficiency of the second stage of compression and to reduce the temperature of the gas under final discharge pressure conditions.

The first attempt to subject these conditions to engineering analyses seems to be a report by T. R. Weymouth[1] which states, "Many tests have proven that isothermally based volumetric efficiencies fit practical conditions very well." Subsequently, P. M. Biddison[2] concurred for all practical purposes with the findings of Mr. Weymouth.

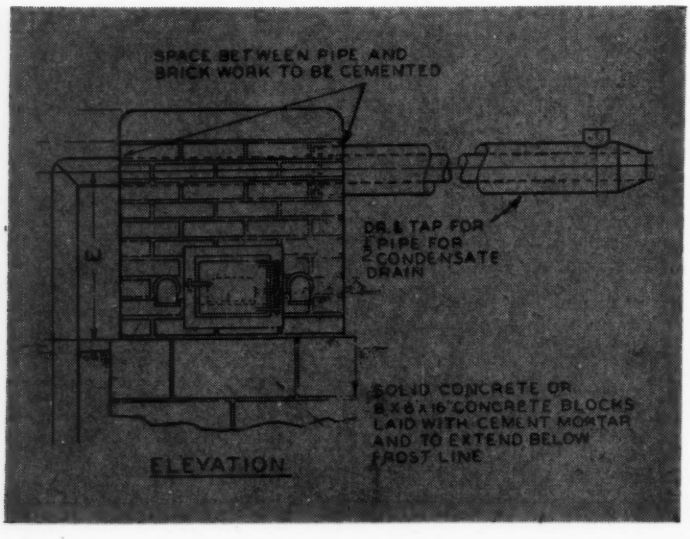
Where it was found necessary to provide some form of cooling to lower the temperature of gas between the first and second stages of compression, it was usually accomplished by providing a small water-filled reservoir through which the nested gas pipes passed. The water itself was cooled by circulating it through a series of spray nozzles, thereby taking advantage of evaporative cooling. For various reasons, mostly economical, this type of cooling has been replaced by closed-system cooling towers.

While this development was taking place, it was recognized that the reverse

1 Weymouth, T. R., *Transactions* ASME, 1912, p. 185. 185.

2 Biddison, P. M., *Oil and Gas Journal*, May 14, 1931, p. 25.

Fig. 1. One early-day approach to the freezing problem was this small furnace, having a heat exchanger mounted around and concentric with the main gas pipe through which the heated products of combustion passed.


SPACE BETWEEN PIPE AND BRICK WORK TO BE CEMENTED
DR. & TAP FOR 1 PIPE FOR CONDENSATE DRAIN
SOLID CONCRETE OR 8 X 8 X 16 CONCRETE BLOCKS LAID WITH CEMENT MORTAR AND TO EXTEND BELOW FROST LINE
ELEVATION

EQUIREMENTS IN PIPING

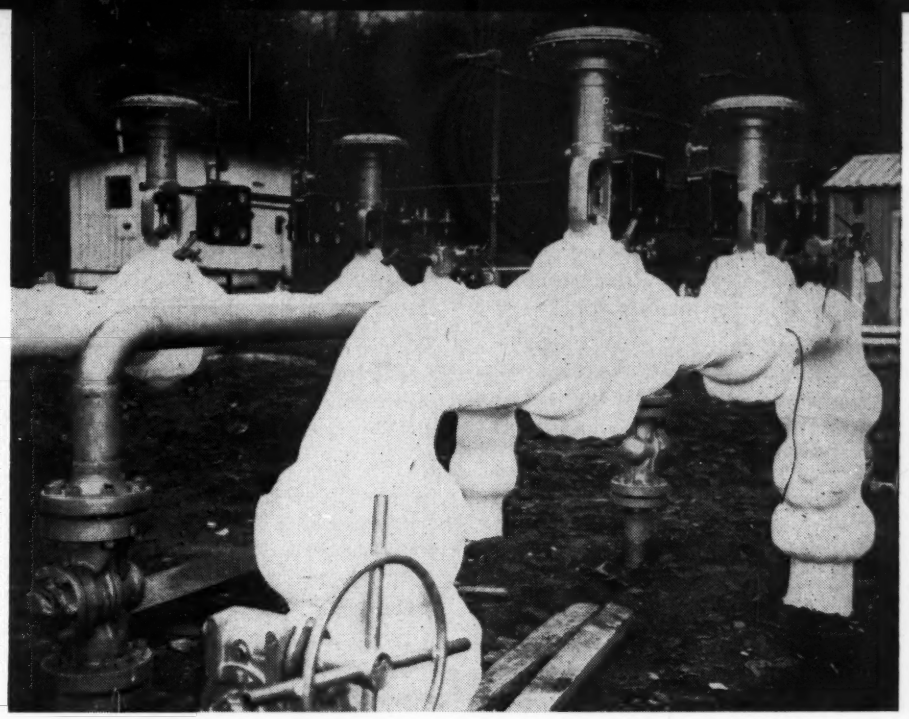


Fig. 2. Reduction of a 20 MMcf-per-day flow of gas from 500 psi to 240 at Moundsville, W. Va., caused the freezing condition as shown.

condition, a reduction in temperature, was produced by a sudden reduction in pressure. Because of the moderate pressure conditions as compared with present day operating conditions, the difficulties encountered were not serious.

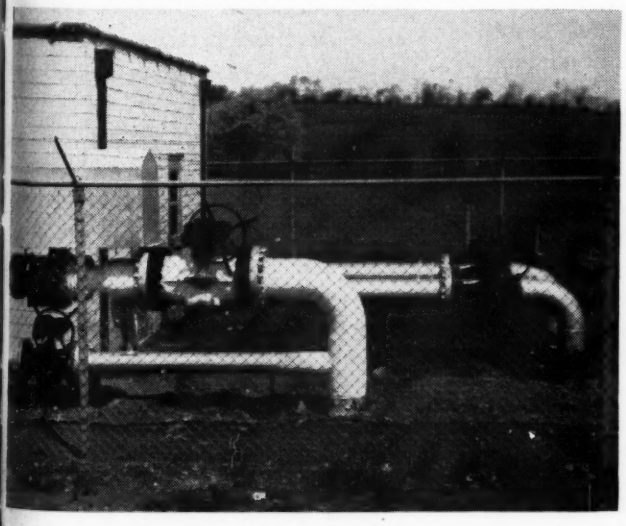
In the *Natural Gas Handbook* published in 1927, the author states, "In the use of the high pressure regulator, trouble sometimes occurs on account of freezing of the valves due to the expansion of the gas. The expanding gas rapidly absorbs heat and leaves the valve chamber at a temperature much below freezing." "The gas main should be heated before it enters the regulator." The author also shows a picture of a small sheet-iron heater for use on a high pressure line entering a meter or a regulator station, and he continues with a detailed discussion of conditions encountered in connection with regulating devices of this kind.

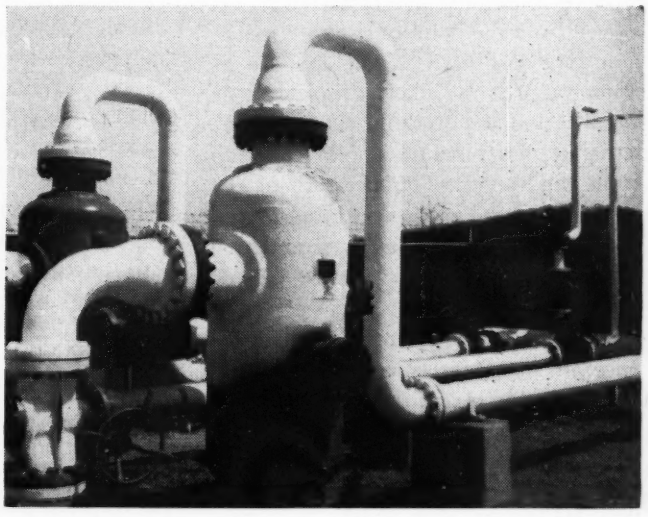
In the Pennsylvania gas field at the turn of the century, while the natural gas business was in its infancy, many crude types of heaters were employed. The experience in Ohio in those early days was very much the same. Little or no attempt was made to determine by calculation the amount of heat necessary to correct any existing troublesome condition. The nearest approach to standardized equipment consisted of a small brick furnace with a heat exchanger mounted around and concentric with the main gas pipe through which the heated products of combustion passed to a flue immediately on the inlet side of the regulating or pressure reducing device. *(See Fig. 1.)*

This condition still exists in the local producing areas in the Appalachian region because much of the gas carries small quantities of water vapor, which is easily frozen. It is particularly troublesome when regulators are delivering a minimum quantity of gas so that the valves are very slightly open and where the inlet pressures are usually built up to a maximum. In these cases the vena-contracta, and consequently the point of lowest temperature, is immediately adjacent to the regulator valve. Under these conditions the regulator is prone to freeze and refuses to open when pressure conditions require an increase in the flow of gas. A very small amount of heat applied either directly to the regulator itself or to the gas stream on the inlet side will suffice to keep a regulator functioning under such conditions.

Simultaneous with this development a

Fig. 3. In mid-summer, at a station near Pittsburgh, a gas cleaner as well as the piping system took on a heavy coating of frost as the result of sudden pressure drop in the gas.





considerable amount of research work was done on the design of the regulating device. The development was discussed by the present author in an article.[3] Several hundred pressure regulators were redesigned in the manner suggested in this publication. Some of the regulator manufacturers have conducted similar investigations and as a result have redesigned their product so as to minimize the sticking of the regulator valves because of freezing within the regulator itself.

With the decline in production in the whole Appalachian area and the development of high pressure long-distance transmission of gas with the resultant increase of the pressure levels, the methods and equipment developed under more moderate pressure conditions no longer suffice. The greatly increased deliveries resulting from increases in the number of customers and the widespread development of the use of gas for house heating has greatly increased the heat transfer problem where extensive pressure reductions were necessary.

These radically changed conditions have presented trouble beyond the experience of the otherwise skilled operators, thus making necessary careful engineering analysis. The great amount of refrigeration caused by the very large amounts of gas being handled under very high pressure conditions has introduced an entirely new problem into gas transmission and distribution. This condition is not confined to the winter months, but in many cases is prevalent also during the summer months.

This condition is vastly different from that discussed with reference to the freezing within the regulator itself. Under these conditions much of the gas has been dehydrated so that the gas itself does not freeze. The larger deliveries produce a vena-contracta farther removed from the point of pressure reduction. The gas itself in the absence of water vapor is not likely to form ice or hydrates but the freezing condition external to the pipeline system resulting from the very low temperature of the gas stream produces a very troublesome condition because of the accumulation of ice or frozen ground on the outside of the gas-carrving pipe. It is this condition, quite different from that experienced in the Appalachian region and of much greater magnitude, to which this report is directed. Because of the greatly increasing deliveries and the higher pressures, the amount of heat required to overcome this condition is very much greater than that required to prevent the regulators themselves sticking because of the accumulation of ice on the valve seats.

The freezing of the ground around the pipelines on the discharge of some of the large pressure reducing stations has caused fences to be uprooted, buildings to be damaged, and paved roads to be raised to the point of presenting serious traffic hazards. *Fig. 2* shows conditions at a Texas Eastern delivery point for Moundville, W. Va., where 20 MMcf a day of natural gas is reduced from 500 lb to 240 lb. *Fig. 3* shows conditions as existing during the summer time at a station near Pittsburgh where the cleaner and piping system are coated with frost.

This problem was discussed at some length by A. B. Lauderbaugh,[4] chief gas engineer, Manufacturers Light & Heat Co. Mr. Lauderbaugh states, after discussing the general situation, that "heaters for sizable pressure drops in large quantities of gas must be very carefully sized to meet the requirements of gas and heat load, heat transfer rates, etc." It is the purpose of this study to present a method of calculation whereby the heat requirements for this purpose can be determined. In practical applications, however, allowances must be made for the efficiency of the heat application, heat loss from the system, and the rate of heat transfer through the heat exchanger to the gas system.

In the following sections, the derivation of the thermodynamic table and chart used in the calculation of heating requirements is given. In addition, a sample calculation illustrating the use of the chart is presented.

[4] Lauderbaugh, A. B., *Gas Age*, August 1951.

2. Calculation of enthalpy—temperature pressure relationships

Thermodynamic charts relating the enthalpy, pressure, and temperature of natural gas are normally presented in such a form that small temperature changes, which may be very significant under large flow volumes and low temperature, are difficult to predict with consistent accuracy. Calculation of heating requirements is also hampered by these same conditions.

Table 3 presents a consistent set of data, giving the relative enthalpy of the described gas in terms of pressure and temperature. The values of enthalpy, temperature, and pressure are given in engineering units to eliminate use of conversion factors as much as possible.

In the following section an outline of the procedure used in calculating the thermodynamics data used in the preparation of *Table 3* and *Fig. 4* is presented.

Explanation of the use of *Fig. 4* in the solution of practical problems involving the throttling expansion of a gas is given in the succeeding section.

Calculation of Data. A consistent set of data, as is desirable in this instance, is most easily determined using a derived form of an equation of state (PVT equation) to calculate the change in enthalpy with pressure (at constant temperature), and specific heat equations to calculate the change in enthalpy with temperature (at constant pressure).

Calculation of the empirical constants involved in the more rigorous equations of state for natural gases of various compositions would entail a large amount of experimental work. However, Su and Chang[5] and Su, Huang, and Chang[6] have derived a generalized form of the Beattie-Bridgeman Equation in which the constants used may be calculated from a knowledge of the critical temperatures and pressures of pure gases and the pseudo-critical temperatures and pressures in the case of gaseous mixtures.

The generalized equation is reported[6] to have reproduced the compressibility data of the six mixtures studied with an average deviation of 1% over a wide temperature and pressure range including points approaching the critical density.

In the case of pure methane, Su and Chang[5] report the average deviation between calculated and observed pressures was 0.163% for the 60 points calculated.

The pseudo-critical temperatures and pressures of mixtures were calculated using the linear mixture rule in terms of mole fractions as proposed by Kay.[7]

[3] Kerr, T. H., *Oil and Gas Journal*, "Gas Regulator Design and Operation," June 16, 1927.

[5] Su, G. J., and Chang, C. H., "JACS" *68* 1080 (1946).

[6] Su, G. J., Huang, P. H., and Chang, Y. M., "JACS" *68* 1403 (1946).

[7] Kay, W. B., "Ind. Eng. Chem." *28* 1014 (1936).

Table 3. Enthalpy (Btu/1 Mcf) *

Temp. (° F)	(Pressure Psig) —14.69	0	100	200	300	500	800	1000	1500	2000
20	0	—24	—192	—363	—540	—906	—1485	—1885	—2856	—3626
30	225	202	40	—126	—295	—645	—1193	—1568	—2479	—3219
40	452	429	273	112	—50	—386	—906	—1259	—2117	—2826
50	679	657	506	351	195	—126	—621	—956	—1763	—2446
60	908	887	740	590	440	132	—341	—658	—1425	—2077
80	1370	1350	1212	1073	932	647	215	—74	—767	—1367
100	1838	1819	1689	1559	1427	1162	763	500	—133	—709
120	2312	2294	2172	2049	1926	1679	1309	1066	486	—28
160	3285	3269	3160	3051	2943	2724	2402	2193	1695	1251
200	4284	4270	4172	4074	3976	3784	3501	3317	2882	2492
240	5315	5302	5214	5125	5039	4866	4614	4452	4068	3722

*1000 cu ft at standard conditions of 14.73 psig and 60° F.

The equation proposed by Su, Huang, and Chang[6], rewritten in the expanded or "virial" form, may be expressed:

$$pv = RT + (FT - E/T^2 - K)(1/v) + (L - G/T^2 - HT)(1/v^2) + J/T^2 (1/v^3) \quad (1)$$

where: p, T, V, and R are the abs. pressure, abs. temperature, molal volume, and the "gas constant" in consistent units.

$E = c'R^2(T_c^4/P_c)$
$F = B'_oR^2(T_c/P_c)$
$G = B'_oc'R^3(T_c^5/P_c^2)$
$H = b'B'_oR^3(T_c^2/P_c^2)$
$J = b'B'_oc'R^4(T_c^2/P_c^3)$
$K = A'_oR^2(T_c^2/P_c)$
$L = a'A'_oR^3(T_c^3/P_c^2)$

T_c = critical or pseudo-critical temperature
P_c = critical or pseudo-critical pressure
$A'_o = 0.4758$
$a' = 0.1127$
$B'_o = 0.18764$
$b' = 0.03833$
$c' = 0.05$

The basic equation for calculating the change in enthalpy with pressure at constant temperature for an equation of state explicit in "p" is:

$$(H - H_o)_T = pv - p_0v_0 - \int_{v}^{v_0} pdv + T\int_{v}^{v_0} \left(\frac{\theta p}{\theta T}\right)_v \frac{dv}{v} \quad (2)$$

Finding the value of pdv and $\left(\frac{\theta P}{\theta T}\right)_v$ for the equation of state (Eq. 1), integrating and substituting in Eq. 2:

$$(H - H_o)_T = pv - p_0v_0 - \left[\left(\frac{3E}{T^2} + K\right)\left(\frac{1}{V} - \frac{1}{V_o}\right) + \left(\frac{3G}{2T^2} - \frac{L}{2}\right)\left(\frac{1}{V^2} - \frac{1}{V_o^2}\right) - \frac{J}{T^2}\left(\frac{1}{V^3} - \frac{1}{V_o^3}\right)\right] \quad (3)$$

Equation (3) expresses the change in enthalpy of one mole of gas going from pressure "p_o" to "p" (v_o to v) at constant temperature "T". Constants in the equation are those defined under Eq. (1).

The change in enthalpy with temperature at constant pressure $(H - H_o)_p$ is given by the equation:

$$(H - H_o)_p = \int_{T_o}^{T} c_p dT \quad (4)$$

Specific heat (c_p) data for the pure components were taken from data prepared by the American Petroleum Institute Research Project 44.[8]

[8] American Petroleum Institute Research Project 44, National Bureau of Standards. Selected Values of Properties of Hydrocarbons. Table Nos. ov and lv, Heat Capacity, c o/p, 1949.

The c^o_p values for the natural gas at the given temperatures were calculated from the c^o_p data for the pure components by the linear mixture rule using mole fractions. The c^o_p vs. T data for the natural gas were then graphically integrated to determine the change in enthalpy with temper-

TABLE 1. Calculation of pseudo-critical temperature and pressure

Component	Mole Fraction (x)	Critical Temp. T_c (°K)	x T_c	Critical Press. Pc (atm)	x P_c
CH_4	0.945	191.1	180.59	45.8	43.28
C_2H_6	0.035	305.2	10.68	48.8	1.71
C_3H_8	0.010	369.9	3.70	42.01	0.42
CO_2	0.005	304.1	1.52	72.9	0.36
N_2	0.005	126	0.63	33.5	0.17
		$(T_c)m$ =	197.12°K	$(P_c)m$ =	45.94

TABLE 2. Values of independent constants

Factor	Product	Numerical Value (R = 0.08206)
$E \div (T_c^4/P_c)$	$C'R^2$	3.3669×10^{-4}
$F \div (T_c/P_c)$	$B_o'R^2$	1.26354×10^{-3}
$G \div (T_c^5/P_c^2)$	$B_o'C'R^3$	5.1843×10^{-6}
$H \div (T_c^2/P_c^2)$	$b'B_o'R^3$	3.9743×10^{-6}
$J \div (T_c^6/P_c^3)$	$b'B_o'C'R^4$	1.63065×10^{-8}
$K \div (T_c^2/P_c)$	$A_o'R^2$	3.20396×10^{-3}
$L \div (T_c^3/P_c^2)$	$A'A_o'R^3$	2.96308×10^{-5}

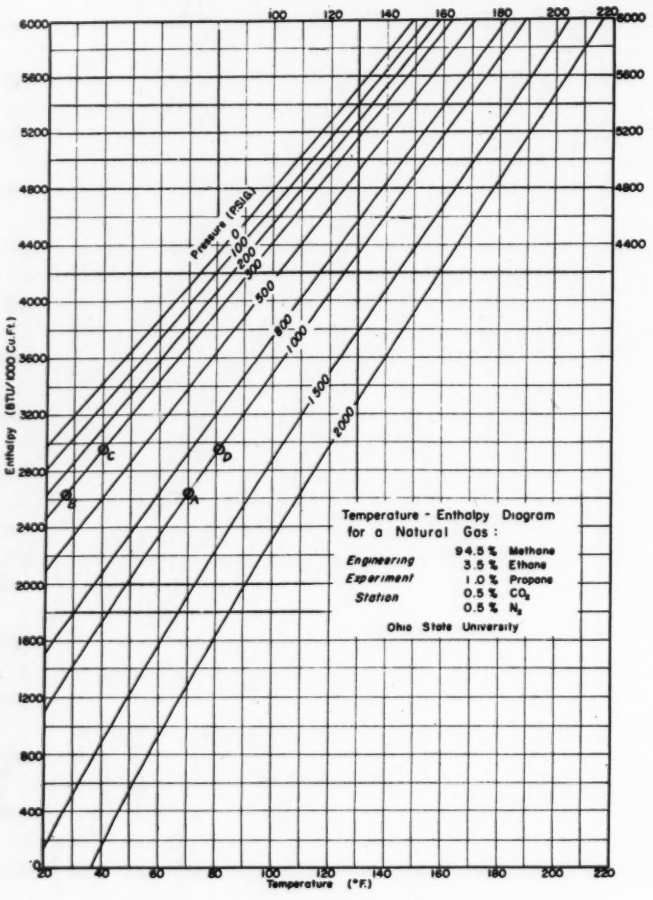


Fig. 4. Temperature-enthalpy diagram for a natural gas.

ature in the ideal gas state (0 absolute pressure).

Using these basic equations and data, *Table 3* was prepared in the following manner:

1. *Calculation of pseudo-critical temperatures and pressure:* For a natural gas of compositions: 94.5% CH_4, 3.5% C_2H_6, 1.0% C_3H_8, 0.5% CO_2, 0.5% N_2, calculation of the of the pseudo-critical temperature and pressure are indicated in *Table 1*.

2. *Evaluation of constants:* Values of the constants in Equations (1) and (3) were evaluated for expressed units of liters, atmospheres, and °K, for gm-molal volume, pressure, and temperature respectively.

Table 2 lists the products of the factors for each of the constants which are independent of the gas composition. Value of the gas constant, "R", is equal to 0.08206 atm., liter, per gm-mole, °K, for the units used.

3. *Calculation of volumes:* The volume of the gas (liters/gm-mole) at each temperature-pressure combination listed in *Table 3* was found by trial and error solution of Eq. 1.

4. *Calculation of change in enthalpy with pressure at constant temperature:* The isothermal change in enthalpy of the gas going from zero absolute pressure to the pressure listed was calculated using Eq. 3. Values of $(H-H_o)_T$ thus calculated have units of liter-atm. per gm-mole, and were converted to cal/gm-mole by multiplying by the factor 24.22.

Since the initial state at each temperature is referred to zero pressure, $v_o = oo$ or $1/v_o = 0$.

5. *Tabulation of data (Table 3):* In setting up *Table 3*, the reference state was taken as zero pressure (abs) and 20° F. The enthalpies (relative to this reference state) at zero pressure from 20° F to 240° F were determined by a graphical integration of the c^o_p values for the mixture. The values for change in enthalpy with pressure as calculated using Eq. 2 were added to these base values. The enthalpy values in units of (cal./gm-mole) were converted to (Btu/1 Mcf) by multiplying by the factor: 4.763.

6. *Preparation of Fig. 4:* In plotting the data as listed in *Table 3*, 3000 Btu/1 Mcf was added to each of the enthalpy values to eliminate possible errors in interpreting the chart between negative and positive values of enthalpy. The reference state for *Fig. 4* is therefore empirically defined as 3000 Btu/1 Mcf at 20° F and an absolute pressure of zero.

Use of Fig. 4: Use of *Fig. 4* for calculating heating requirements (in terms of Btu's to be absorbed by the gas), and the cooling effect when undergoing throttling expansion will be explained by illustrative examples.

3. Solving a heating requirements problem

Ten MMcf per day of natural gas at 1000 psig and 70° F is to be throttled to 300 psig.

A. If the gas is not heated prior to expansion, what would be the temperature of the gas after expansion?

B. How many Btu's per hour must be added to the gas and to what temperature must the gas be heated to hold a temperature of 40° F on the exhaust side of the reducing valve?

Solution using Fig. 4:

(Part A): Making the usual assumptions that true throttling or Joule Thomson expansion occurs at the reducing valve, the expansion takes place at constant enthalpy. That is, on the chart, the path of a gas undergoing adiabatic throttling expansion would be a straight horizontal line between the initial point as fixed by the temperature and pressure of the gas, and the final point as determined by the intersection of the constant enthalpy line with that representing the final pressure.

The initial point for the gas is located by the intersection of the 1000-psig and 70° F lines, corresponding to an enthalpy of 2640 Btu/1 Mcf (Point A).

The intersection of the horizontal (constant enthalpy) line representing 2640 Btu/1 Mcf, with the 300-psig line (Point B) determines the final conditions of the gas, indicating a final temperature of 27° F if the gas is not heated prior to expansion.

(Part B): The desired temperature and pressure of the gas after expansion is 40° F and 300 psig (Point C). This fixes the enthalpy of the gas before, as well as after, expansion at 2960 Btu/1 Mcf, since the expansion occurs at constant enthalpy.

The initial enthalpy of the gas (at 70° F and 1000 psig) is 2640 Btu/1 Mcf. Therefore, 2960-2640 = 320 Btu/1 Mcf of gas must be added to the gas. At the rate of 10 MMcf per day or 417 Mcf per hour, the heat supplied *to the gas* must be equal to 417 x 320 = 133,000 Btu hr.

The heat is supplied prior to expansion at a constant pressure of 1000 psig, until the enthalpy of the gas is equal to 2960 Btu/1 Mcf. The temperature to which the gas must be heated is found by following the 1000-psig line until it intersects the interpolated line representing 2960 Btu/1 Mcf (Point D).

The temperature of the gas at 1000 psig having an enthalpy of 2960 Btu/1 Mcf is 81° F, the temperature to which the gas must be heated.

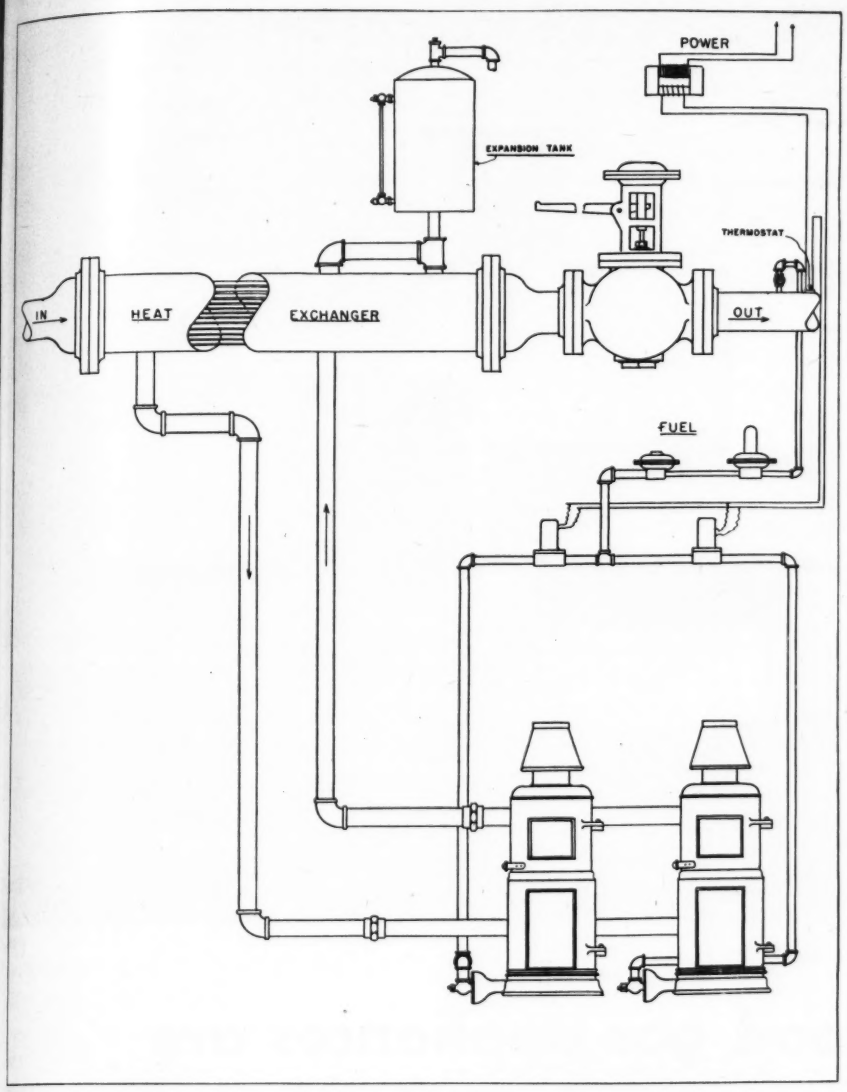


Fig. 5. Arrangement of heating equipment for preventing freezeups.

4. Accuracy and applicability

A definite statement as to the accuracy of the data given in *Table 3* cannot be made. However, considering the limited temperature and pressure range, and the reliability of the generalized Beattie-Bridgeman equation in the calculation of compressibility data, the values listed in *Table 3* are probably within engineering accuracy.

Although the data were derived for a natural gas of specific composition, it may be applied, without significant error, to natural gases having a percentage of methane varying from 96 to 92% and ethane and higher content from 3 to 6%.

The particular composition of gas chosen is believed to be typical of the gas carried by the high pressure transmission lines from the Southwest.

Considering the variations in flow rates and assumptions made in determining the efficiencies of a typical heater installation, the error introduced in using *Fig. 4* for a natural gas of composition beyond the stated limits of applicability might well be a negligible source of error, in the overall calculation.

5. Summary

A set of data giving the enthalpy of a natural gas in terms of the temperature and pressure has been calculated using the Generalized Beattie-Bridgeman Equation of State. Determination of relatively small temperature changes and heating requirements involved in throttling expansion of natural gas may be determined with consistent accuracy by use of the thermodynamic plot presented.

The data are given in engineering units to hold calculations and conversion of units to a minimum.

The data are applicable to natural gases having a methane content of 96 to 92% and ethane (and higher) content of 3 to 6%.

Equations and procedures used in the calculations are given to facilitate the preparation of similar sets of data for natural gases of markedly different composition.

6. Application of heat

Having calculated the amount of heat necessary to prevent the reduced pressure gas forming hydrates or creating a frost condition around the outlet pipes, the heat can be applied in any number of ways.

The first essential is a good heat source. Large size copper coil heaters either singly or in manifold are quite satisfactory for this purpose within their limited capacity.

A suitable heat exchanger can be obtained from many sources. (See ASME Classified Catalog.) Any properly sized heat exchanger, if made to operate under the pressure conditions, will serve for this purpose.

As a ground guide to sizing of tubular heat exchangers, an overall heat transfer coefficient of 50 Btu/hr per sq ft per °F temperature difference may be assumed for maximum flow rate of approximately 10 MMscf (at 800 psi) per hr per sq ft of cross-sectional area. One-half to 1 in. OD, 14 or 16 BSG tubing, in sufficient number to provide adequate cross-sectional area and of proper length to give the required heat transfer area may be used.

The general arrangement of such equipment is shown diagrammatically in *Fig. 5*. No sizes are given for the reason that each installation must be engineered to fit existing conditions and the materials available.

It will be noted that the heat transfer fluid, usually water, should contain some kind of anti-freeze and the heat input should preferably be controlled by a thermostat located so as to be exposed to the temperature of the outlet gas.

The use of steam as a heat transfer medium is not recommended (notwithstanding its latent heat of vaporization) because of the difficulty of controlling steam operations in remote areas where many of these installations must be made and operated.

Note: Larger and more readable copies of the chart, *Fig. 4*, may be obtained for $1 per copy from Dr. E. E. Smith, Engineering Experiment Station, Ohio State University, Columbus.

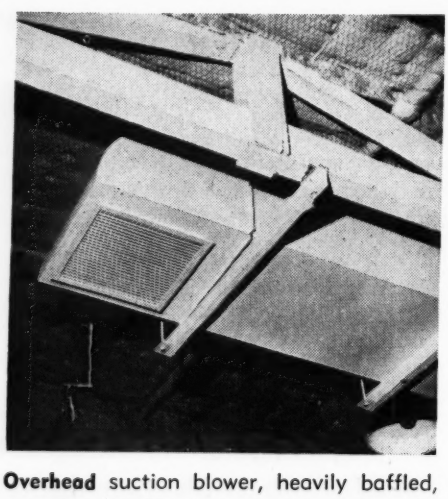
Here's where gas plays host to any TV production needing a kitchen set. Naturally, it's all gas.

In Hollywood, gas appliances are playing host to TV productions

By JAMES JOSEPH

IN Hollywood's TV industry, gas kitchen appliances are now getting more calls than ever for substantial supporting roles. The trick was to *bring the stars to the gas appliances,* and it was done by building a gas appliance-equipped sound stage, complete with range, refrigerator, and dryer, and making it available rent-free to producers of TV films, live shows, or spot commercials for any production in which one of these gleaming kitchen props is needed.

This is an AGA "first," for it was the first industrial sound stage especially constructed for TV and thrown open to any production company. So successful has been this first effort to tie into TV, that AGA has already planned a second stage to be located in New York City, the U. S.'s second big TV film center. But that still leaves some 145 other U. S. cities with 208 active TV stations—and no gas appliance stages.



Overhead suction blower, heavily baffled, can clear studio air in matter of seconds.

Here's where astute gas utility publicity men can score a local triumph: nearly every town and city with one or more TV stations would welcome a gas-appliance sound stage.

"And," says Pat Nicholson, AGA's Hollywood coordinator, "such local stages would get plenty of use. Almost every TV station originates local cooking schools, home economics demonstrations, and commercials calling for a kitchen setting."

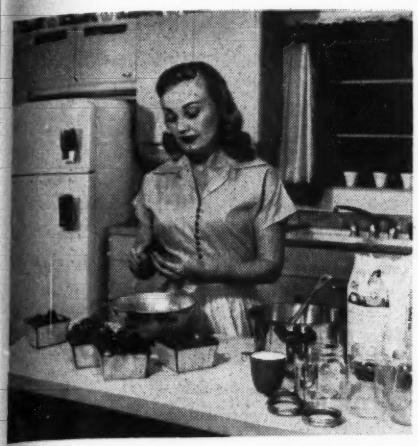
Recently, a nationwide survey among TV prop men revealed that almost all are hard pressed for stage props—especially kitchen settings. Some have resorted to borrowing from local appliance dealers. A few buy their settings outright. The majority are searching for something "better." That "better" something? Either a gas kitchen set of their own, or one available to all local stations.

GAS exclusive

Here's where alert gas utility sales managements get their cue.

The TV stage needn't be as elaborate or as costly as AGA's. But since AGA's is the first of its kind, let's take it as an example of a properly engineered gas-appliance set.

AGA's stage is located in a garage,



This girl is preparing a fancy dish over a prop table in AGA's TV studio.

adjacent to Southern California Gas Co.'s Beverly Hills office. Like most studios wired for sound—and TV cameras—the set is something special. So was its cost —$10,000 (not including the space, donated by SoCal Gas).

Inside the garage's walls have been built "free standing" walls, which have no metal connections (thus no nails or bolts) to the outer garage. This prevents sound transmission and vibration to the appliance set. Free standing walls are isolated further by a 3-in. air space, filled with overlapping sheets of sound-deadening 1-in. thick acoustical board. Next come 2 x 4-in. studs, then a coating of ⅝-in. gypsum, and finally a 2-in. thick acoustical quilt (really 2-in. fiberglas pads enclosed in muslin and stapled to the studding). The stage measures 28 ft x 30 ft, with an anteroom in case long shots are required.

Unique setup

Inside of all this is a unique gas appliance setup—a complete gas kitchen and laundry: range, gas refrigerator, gas water heater, and gas clothes dryer with matching automatic washer.

The set is so designed that it can be torn down and its appliances rearranged within an hour's time. Six different stage settings are possible. This gives necessary variety, yet retains that variety all within a single set.

The model kitchen can be broken down into 8 to 10 sections. Each section consists of a 1 x 4-in. framing. Tied to each section is an appliance and a portion of the set's background — cabinets, a papered furring strip, baseboard, etc. Individual framed sections are wing-bolted together, thus are easily detachable. When a set redesign is necessary, various sections are unbolted, rearranged, and the wall paper strips reinstalled.

All piping behind the sections is flexible, including gas lines. Thus, the framed range section can be moved half way across the stage without repiping. Hot and cold water lines to the sink are likewise extendible, being of 2- and 3-in. rubber tubing. Drains empty through flexible hosing. All piping to appliances is heavily wrapped with sound-deadening materials.

To further isolate vibration, the studio's floor slab, which was connected to a concrete driveway, thence to the street, has been segregated. A 1-in. wide routing was cut in the concrete slab, completely surrounding the sound stage. Then this gap was filled with tar and felting. Street vibrations can't penetrate the gap, and are therefore isolated.

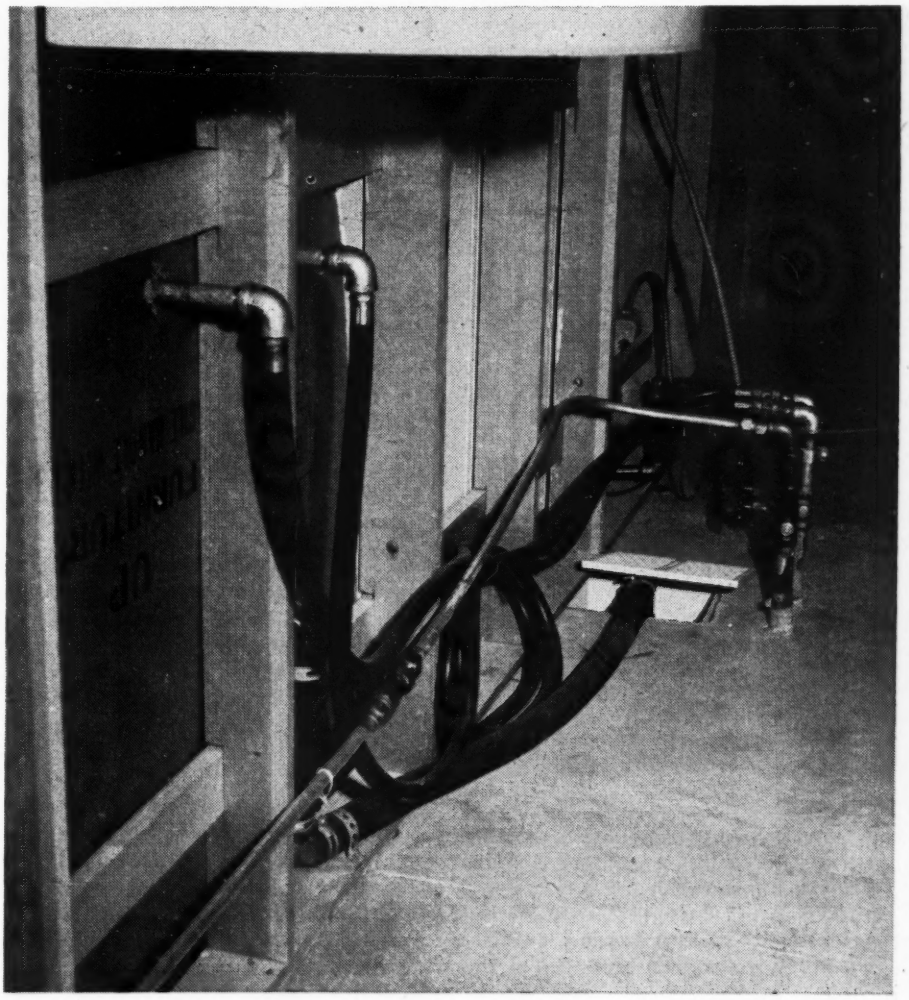
Another feature is an overhead 1330-cfm exhaust fan for quick changing of studio air. Even though heavily sound-proofed, the fan is not normally operative during production. Yet it can change the air within 20 seconds. Ducts from studio to roof are sound-proofed by an elaborate series of baffles.

No noise in studio

The studio was engineered to shut out all noise up to 40 decibels—which in sound parlance means exclusion of all outside noise—for practical purposes.

Some other features: double 1¾-in. solid core studio doors, 4 ft wide with special sound seals; 200 amps of power furnished on stage; special fixtures for studio lights; walls and cabinets finished in flat colors to reduce reflection; near-at-hand dressing and rest rooms; and loading driveway.

Whom should gas utility PR men con-



Flexible piping behind studio kitchen allows various sections to be rearranged without repiping.

Production-line methods cut costs in dressing soldering coppers

By **JAMES WEBB** • Consolidated Edison Co. of New York

GAS meters since their advent in the early 19th century have been built and repaired by hand, using a soldering-copper for applying solder. The soldering-copper melts the solder and raises the temperature of the members to be joined above the liquidness of the solder being employed. Therefore, the primary requisite of a soldering-copper is the capacity to absorb and retain heat; because copper meets this requirement, it is the metal most often used in soldering irons.

The soldering copper (known also as a soldering iron) is a very important tool in the gas meter repair shop. To make a good gas-tight meter seam, the soldering copper has to be smooth and clean at all times. With a smooth, clean copper, it is no problem to keep the copper well tinned and the mechanic can get an even flow of solder to the parts that are to be joined. If copper is not kept clean, the time required to heat members is longer and there is always the possibility of burning tin-plate in spots, thus making it impossible to sweat a good seam.

Former practice

In the past, each mechanic dressed his coppers to his individual liking. Considerable filing and forging of coppers was required several times a day, so vises and anvils were distributed throughout the gas meter repair shop. Aside from this being a laborious operation, considerable stock is taken from soldering coppers each time they are filed.

Because of the rising costs of materials and increasing operating expenses, a study was made of the dressing operation with a view to saving time and stock in this operation. It was decided to have soldering coppers dressed at one central location by an employee trained in their various uses.

Revolving belt used

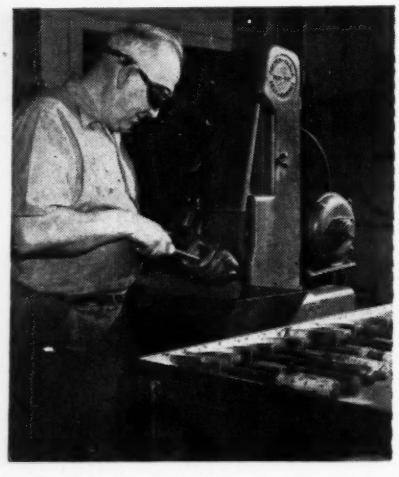
To dress coppers on a production basis, a vertical endless belt grinder was purchased. The revolving belt is continually sprayed with water to which an antiseptic is added to prevent infection to operator. A small pump keeps water circulating. Filings from coppers fall in a trough and are screened from water. Sufficient soldering coppers are dressed each day to equip all mechanics with as many changes of coppers as their work requires.

Coppers dressed on a belt grinder require very little attention after several dressings. With the manual method, no two mechanics dress coppers the same way; consequently, more or less copper is wasted. There is a distinct advantage where new employees are concerned, in that they will use soldering coppers dressed correctly for the particular job to which they are assigned in the gas meter shop.

Standard copper designed

After considerable experimenting and research, a standard copper was designed for each of the numerous operations in the gas meter repair shop. For instance, opening of meters requires a heavier copper than installing valve box covers.

The saving also applies to files which are made of steel—an expensive item in any shop. The belt grinder eliminates the use of the heavy files which had been issued to each mechanic. Now, each mechanic uses a very fine file for occasional touching up of copped between changes. These fine files are mostly used to clean the coppers employed in opening meters where a large amount of soldering flux is used.



Dressing of soldering coppers is a delicate and important operation in the meter shop.

tact at their local TV stations? Pat Nicholson suggests the prop department, if the station is large enough to have one. If not, the station manager is the logical top-level contact. And the offer to equip or build a gas-applianced stage should meet with enthusiasm for tie-ins have become an established fact in both the motion picture and television industries.

When Mr. Nicholson conceived the idea, he sent out questionnaires, asking if producers could use a rental-free studio for their TV filming. Ninety per cent answered with an enthusiastic "yes," saying they'd use the setup anywhere from once a week to two or three times a year. Many local TV stations, however, have need for a similar stage at least five days a week, Monday through Friday, the favorite days for cooking schools.

When the stage was ready, he saw it as an enticer of much more than just TV publicity. He dispatched brochures, announcing its opening, to southern California's 300 ad agencies, to 200 Hollywood TV film production companies, and to various commercial photographers. Commercial photographers, says Mr. Nicholson, are not to be overlooked. Often they must produce advertising stills for companies manufacturing food products and the logical background is a gas-applianced kitchen. Why contact advertising agencies? They're often the originators, on a local level, of TV programs. If you're lucky, they might use your set as the star of a continuing script sequence.

Mr. Nicholson's brochure read, "Now open for your use—rental free. As a public relations service, the gas industry (in this case, the utility) offers the use of this studio, rental free, to film and live-show producers and to photographers—where a kitchen or laundry set is required. You can . . . work in quiet . . . it's soundproofed! Take your choice of six floor plan variations! Forget set lighting worries—ample power is provided!"

AGA's West coast kitchen studio is growing in popularity. With TV film production swinging into high gear during the fall and winter months, Mr. Nicholson expects a corresponding increase in studio bookings. Moreover, a few tie-ins and the set's original investment will be more than repaid. After that, the only cost will be for electricity, water and minimum maintenance. Appliances are supplied by various manufacturers.

Pat Nicholson's advice: "Latch onto the opportunity in your own community. Make gas a star performer on TV."

Flanked by a shirt-sleeved capacity audience, James F. Oates Jr., Peoples Gas Light; Frank C. Smith, Houston Natural; Dean H. Mitchell, Northern Indiana; and Lyle C. Harvey, Affiliated Gas Equipment, laid down a challenge to the gas industry at the "Coats off for Action" luncheon, which was the highlight of the St. Louis show.

"Coats off for action" provides spark for AGA's 35th annual convention

URGING the gas industry, now the sixth largest in the U. S., to take its rightful place among other industries with faith, belief, and vision in the future, James F. Oates Jr., chairman of the Peoples Gas Light and Coke Co., set the theme for the 35th annual AGA convention held in St. Louis on Oct. 26-28.

Speaking before the "Coats Off For Action" luncheon on the final day of the convention, he emphasized the importance of the PAR program, the industry development program, and the industry's public relations program, and pointed out that in each instance the success of the program depends upon the combined effort of the gas utility and the gas appliance manufacturer.

GAS staff report

Using the amount of money spent for research by the gas industry as an example, Mr. Oates declared that this allocation is far less than that spent by other industries of comparable size. Only 16% of the 1953 PAR funds were spent for basic technical research, whereas industry as a whole spends 2½% of their gross on technical research.

"If the gas industry spent only 1%," he said, "a total of $30 million could be earmarked for technical development and research." He urged those in the industry for whom research is too expensive or not feasible for other reasons to make use of the facilities of the AGA for this kind of undertaking.

Mr. Oates spoke along with other industry leaders in a two-hour packed-house luncheon where speakers and listeners actually took off their coats to plan for the future. The meeting was presided over by AGA President Frank C. Smith, president of the Houston Natural Gas Corp.

Increased attendance

This year's AGA convention drew an attendance of more than 2400 persons, an increase of some 200 over the St. Louis meeting of 1951. Earl H. Eacker, President of Boston Consolidated Gas Co., was elected president for the coming year, along with the entire slate (see *GAS*, October, page 108), presented by the general nominating committee.

In a much awaited action, the GAMA board reaffirmed its decision of last May not to sponsor its traditional exhibition in Atlantic City, or any other location, in connection with the AGA 1954 con-

vention to be held in that city Oct. 11-14.

Following Mr. Oates' lead at the Coats Off For Action luncheon, Dean H. Mitchell, president of Northern Indiana Public Service Co., and chairman for the Gas Industry Development Program, directed attention to the "startling state of our markets and the aggressiveness and financial capability of our competition."

He pointed out that the action program has been delivered to gas utility presidents in person, and that no president could afford to do less than activate the necessary sales mobilization within his own industry. He highlighted the need for market research and analysis, and emphasized the "ten cities" program in urging other gas utilities to take similar action without delay.

Closing speech of the forum was given by Lyle C. Harvey, president of Affiliated Gas Equipment Inc. and chairman of GAMA's Gas Industry Development Committee. Mr. Harvey branded as "shadow boxing" the industry optimism regarding a statistically attractive increase in gas distribution and demanded bold action to meet the inroads of the competition of electricity in the domestic market. Complacency is the gas industry's only foe, he declared, and the solution to this problem is psychological.

Greatest strength

He pointed out that the greatest strength of the gas industry and its major potential for growth are the men who will direct, guide and stimulate constructive action—men motivated by the belief that no matter how good the situation seems to be it always can and must be improved.

Advising AGA members to choose between this aggressive, profitable course and stagnation, Mr. Harvey outlined a new mental concept of the gas business. This, he said, should be based on a deep-rooted faith in the economic importance of service and product, and their contribution to an improved standard of living and a better way of life for the customers the gas industry serves.

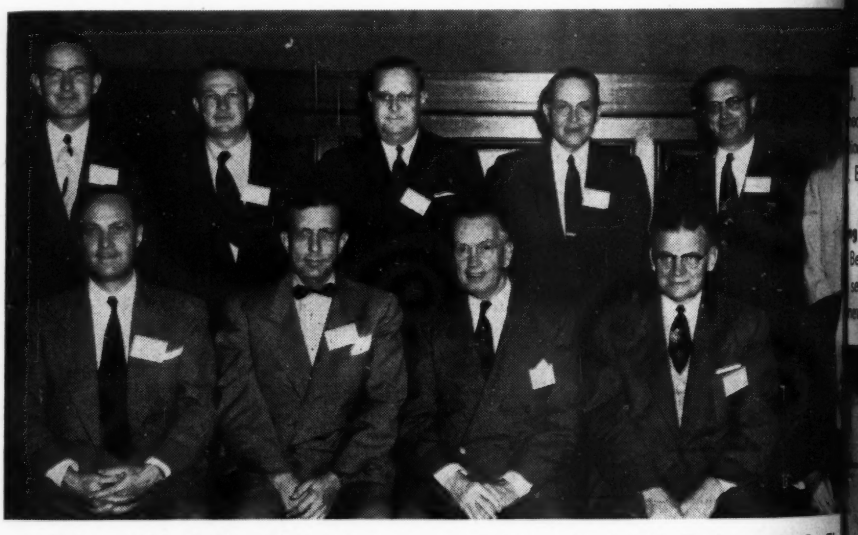
The meeting was closed by President Smith who reminded the audience to keep their coats off for action after they have returned home.

The action theme was also carried out by President Smith in his address before an AGA general meeting, when he pointed out that the gas industry is one of the nation's largest businesses, with a

Continued on page 48

AGA's newly elected officers talk over plans for 1954. From left: president E. Eacker, 1st vice president F. M. Banks, treasurer V. T. Miles, and 2nd vice pres... Dean H. Mitchell.

Admiring Patrick J. McPartlan's meritorious service award are H. Preston More... and John E. Overbeck, both of whom won honors of their own, the Distingu... Service Award and the Distribution Achievement award, respectively.



Order of Accounting Merit winners are (seated, l to r): H. F. Quad, E. R. Eb... D. E. Maloney, J. G. Ross, B. S. Rodey Jr. Back row, from left: A. T. Gardner, ... Rauh, L. R. Michelsen, C. H. zur Nieden, G. B. Herr, P. E. Ewers. (For company ... ations, see story at right.)

Burlingame, Chicago; John F. Mer-
Omaha; and Ralph E. Davis, Hous-
meet in the Kiel auditorium lobby.

of the five home service award win-
Jeanne Snodgrass, Rosemary Locke,
Winnell Simmons, Flora G. Dowler.

Pfluke (left), Rochester, is wel-
ed as chairman-elect of the operating
on by Chairman Channing W. Wil-
Baltimore.

g K. Peck is congratulated by Wal-
Beckjord upon receiving the operat-
section's award of merit. (A list of
ers appears in the column at right.)

AGA rewards outstanding work

Among the awards presented at the annual meeting of the AGA in St. Louis was the Meritorious Service medal, the highest honor that the gas industry can bestow upon an individual for outstanding bravery, which went to Patrick J. McPartlan.

Mr. McPartlan, a rigger employed by Consolidated Edison Co. of New York Inc., won the award for conspicuous bravery on Nov. 28, 1952, when he rescued a fellow worker from the top of a smoke stack.

The action which resulted in the award took place at ConEd's Hunts Point gas plant when an employee of a construction company engaged in pointing up a 250-ft smoke stack was overcome by a gust of wind carrying waste gases from the chimney. A fellow worker lashed the unconscious worker to the iron rungs of the stack and descended for help.

Mr. McPartlan climbed the stack with the wind blowing about 40 miles per hour. He hooked the victim's safety belt to a rope and pulley used for hoisting materials, and descended the stack with the unconscious man to keep him from buffeting against the stack or becoming entangled with iron rings on the stack. This was accomplished by the rescuer hanging onto the rungs of the ladder with one hand while guiding the victim's body with the other.

The AGA Distribution Achievement award sponsored by the American Meter Co., was presented to John E. Overbeck, Columbia Gas System Service Corp., Columbus, Ohio.

The Distribution Achievement award comprises a Certificate of Merit and $1000.

Mr. Overbeck won the award for his efforts in development of procedures and methods of gas measurement. Many of the procedures he assisted in developing are being placed in use by operating companies converting from manufactured to natural gas.

A third major award was presented to H. Preston Morehouse, assistant sales manager —gas, Public Service Electric & Gas Co., Newark, N. J., in the form of AGA's Distinguished Service award for his outstanding contributions to the gas industry.

Largely at the suggestion of and under the leadership of Mr. Morehouse, the AGA "Reference Manual of Modern Gas Service" was organized. Also, under Mr. Morehouse's leadership a "Guide for Installers of Central Heating Systems, Conversion Burners, Floor Furnaces, Vented Space Heaters and Unit Heater," was prepared.

In the field of home service, five winners were presented with AGA Achievement awards sponsored by McCalls magazine. Cash prizes totaling $1000 and bronze plaques were awarded.

Winners were: Miss Flora G. Dowler, Manufacturers Light and Heat Co., Pittsburgh, Pa.; Mrs. Gladys V. Bramblett, Fall River (Mass.) Gas Works Co.; Mrs. Winnell Simmons, Oklahoma Natural Gas Co., Tulsa; and Miss Jeanne Snodgrass, the Ohio Fuel Gas Co., Columbus.

The accounting section made awards in the form of the Order of Accounting Merit to 13 of its own fraternity. Those who received the awards were: Harold F. Quad, E. R. Eberle, and Frank Freer Jr., Public Service Electric and Gas Co., Newark; Daniel E. Maloney, East Ohio Gas Co., Cleveland; J. Gordon Ross, Rochester (N. Y.) Gas and Electric Co.; Bernard S. Rodey Jr., Consolidated Edison Co. of N. Y.; Austin T. Gardner, Delaware Power and Light Co., Wilmington; L. Joseph Rauh, Consolidated Gas, Electric Light and Power Co. of Baltimore, Md.; Lester R. Michelsen, The Peoples Gas Light and Coke Co., Chicago; Carl H. Zur Nieden, Philadelphia Electric Co.; G. B. Herr, Bama Sales Co., Pittsburgh; Paul E. Ewers, Michigan Consolidated Gas Co., Grand Rapids, Mich.; and Arthur W. Hatch, Ebasco Services Inc., N. Y.

Frank H. Adams, president of Surface Combustion Corp., Toledo, Ohio, was the winner of the GAMA Industrial Distinguished Service award. The award was presented by Fred C. Schaefer, chairman of the gas equipment division of GAMA.

Operating section Awards of Merit were presented in person to a group of 28 former chairmen of the operating section and the natural and manufactured gas departments, including D. A. Hulcy, Dallas; William R. Fraser, Detroit; George H. Smith, AGA; J. French Robinson, New York; R. H. Hargrove, Shreveport; L. J. Eck, Minneapolis; E. J. Boothby, Washington, D. C.; George S. Hawley, Bridgeport; William Moeller Jr., Los Angeles; F. A. Lydecker, Newark; O. S. Hagerman, Charleston, W. Va.; I. K. Peck, New York; R. G. Griswold, Henry L. Doherty & Co.; L. J. Willien, San Diego, Calif.; J. B. Klumpp, Philadelphia; H. Carl Wolf, AGA; W. C. Beckjord, Cincinnati; J. Stanford Setchell, AGA; H. I. Mix, Chicago; Rutherford Van Vliet, Stapleton, N. Y.; H. Bruce Andersen, Philadelphia; Elmer F. Schmidt, Dallas; E. G. Campbell, Chicago; A. Gordon King, AGA; Earl H. Eacker, Boston; A. C. Cherry, Cincinnati; Robert W. Hendee, Colorado Springs; George E. Walker, Oil City, Pa.

Award recipients who were not present were Frank C. Smith, Houston; C. E. Bennett, Pittsburgh; C. S. Goldsmith, Brooklyn; L. E. Knowlton, Providence, R. I.; Harry D. Hancock, New York; A. M. Beebee, Rochester, N. Y.; F. M. Goodwin, Boston; J. V. Postles, Philadelphia; C. A. Harrison, Toledo; H. E. Bates, Chicago; N. C. McGowan, Shreveport; F. C. Weber, H. L. Doherty & Co.

Continued from page 46

total investment at the end of 1952 of over $10 billion.

In outlining the progress of the past year President Smith emphasized that a united industry, presenting a solid front, with each element aware of its interdependent relation with the other, and the development of an action program based upon it, has been and is the focus of AGA's principal interest and the guide of the year's activities and effort. In this light he discussed the gas industry development program and the importance of the industry's public relations program.

He summarized the past year as a year of decisions made and adopted, and of an industry-wide realization and preparation for action which he dared to believe would become the mainspring and prime mover of the industry's progress.

Incoming AGA President E. H. Eacker keynoted the action program at the industrial and commercial gas section luncheon as he argued that sales and good customer relations are the foundation stones of any industry. He pointed out that the Gas Industry Development program is a plan of action, the prime aim of which is to develop adequate gas appliance sales volume.

He emphasized that the importance of commercial and industrial sales will not be neglected in the new industry plan for action. The national program is geared to present the factual story of the services rendered by gas and gas equipment, and to help the commercial and industrial people to meet aggressive competition.

Endorsing the action program for the gas appliance manufacturer, James F. Donnelly, president of GAMA, pointed out that a sales problem faced both utility and manufacturer. He spoke before an AGA general session.

Vital factor

On the local level, Mr. Donnelly cited the gas utility as a vital factor in the overall plan. He said that each gas utility must create a favorable sales climate within its own territory. *(For a digest of Mr. Donnelly's talk see page 50.)*

The problem of government control and what to do about it came in for consideration during several of the general meetings. Presenting the government's side of the story, Jerome K. Kuykendall, chairman of the Federal Power Commission, speaking before the opening general session, argued a policy of adequate but not excessive rates. *(For a digest of Mr. Kuykendall's talk see page 49.)*

The current Mrs. America held court during the residential gas section session.

The problem of defining state and federal responsibility in the regulation of natural gas companies was developed further by Eugene S. Loughlin, chairman of Connecticut's Public Utilities Commission, speaking before an AGA general session. He made an attack on mounting federal intervention in state's rights during the past 25 years, and appealed for an increased awareness of the duties and responsibilities of state regulatory bodies.

Pendulum at end of course

Mr. Loughlin pointed out that the pendulum of the federal government's policy has now reached the end of the course it has traced for the past 25 years and the policy has begun to swing in the opposite direction. For this reason, he emphasized, it is more important than ever that the states be prepared to take over the responsibilities they found themselves deprived of recently.

He cautioned, however, that "The field of utility regulation as practiced by the states represents a typical example in which the virility of state government will be assured only so long as it is able to demonstrate a record and a promise of sound and impartial regulation in the public interest."

The problem of government regulation from the producer's point of view was brought out in a speech by Hines H. Baker, president of Humble Oil and Refining Co. Posing the problem with respect to adequate supplies of natural gas for the future, he argued that it is greatly aggravated and made doubly serious by reason of continuing threat of regulation by the Federal Power Commission of the producer's field price of gas moving in interstate commerce.

Mr. Baker enumerated the reasons why he believed FPC control of the field price of gas was unsound and against the best interests of the consuming public. He pointed out that such control was contrary to the intent of Congress when it enacted the Natural Gas Act, and that the production of natural gas was a highly risk-taking venture, wholly different in character from a public utility business.

Government control

He also argued that government control of producer's prices will not serve to protect the interests of consumers as well as will competition, and that artificial control of producer's field price for gas will lead in time to shortages and higher prices.

The Home Service Breakfast, traditionally an annual affair, was well attended as usual. It was presided over by Julia Hunter, Lone Star Gas Co., chairman of the home service committee.

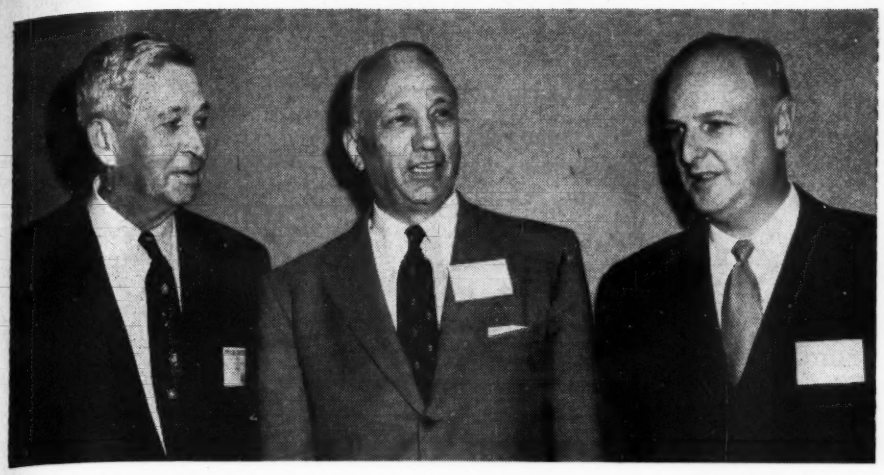
Esther Foley, home service director of Macfadden Publications, New York, who was principal speaker, painted a vivid picture of the typical wage-earner market as she saw it from her travels about the country.

She pointed out that this wage-earner class is the gas industry's mass market, and that they believe in possession and not decor, they buy items and not rooms, and that they buy as a family unit. She emphasized the importance of the family unit, and pointed out that it is necessary to sell both the man as well as the woman in a household on new appliances.

Operating section

Of the operating section meetings, best attended were those which had to do with over-pressure protection and the general subject of electronics in the gas industry. The session on over-pressure protection was moderated by John M. McCaleb, senior distribution engineer of Columbia Gas Service Corp. Rising interest in electronics as a tool for the operating gas engineer drew a capacity audience to the section meeting which included discussions of electronic dispatching and the leasing of mobile radio communication equipment.

Electronics came in for its share of attention in the accounting section meetings with a discussion of electronic computers and their application to present-day accounting methods.



Outgoing AGA president Smith (center) chats with FPC Chairman Kuykendall (right) and Judge S. L. Digby, FPC commissioner, during convention.

FPC studying means of rewarding efficiency while protecting public

By **JEROME K. KUYKENDALL** • Federal Power Commission

A REGULATORY commission has an obligation to endeavor to maintain a regulatory atmosphere which will give the investor enough confidence to let his money be used in enterprises which are regulated by that commission.

On the other hand, it is fundamental that utility rates must not be excessive. It is the duty of regulatory commissions to fix rates which are sufficient, but no more. While the decisions of virtually all rate-making commissions, both state and federal, are subject to review by the courts, the courts do not and cannot become rate-making agencies themselves. Hence the courts do not ordinarily reverse or modify rate decisions unless it is found that they are confiscatory, unconscionably high, discriminatory, or violate some particular statute or constitutional provision. Thus a regulatory commission has a wide area of discretion between confiscation and exorbitance in which it may operate without interference by the courts. Therefore, the duty of the regulatory commission to fix adequate but not excessive rates at the outset is of the utmost importance. A rate decision which is not reversible is not necessarily the best decision which can be made. The primary burden on the regulatory agency is heavy and inescapable. The manner in which its judgment is exercised within this zone of discretion sets the regulatory atmosphere and determines very largely whether or not the public interest has been protected and the utility has been enabled to serve the public as it should.

In unregulated industry the desire for increased profits provides the incentive for increased efficiency which will lower costs. There, efficiency produces its own reward. Unfortunately, it is no simple matter for a regulatory commission to recognize, appraise, and reward a utility for its efficiency. Generally, any savings which have been made by a utility through unusual efficiency are given to the customers of that utility by adjusting the rates in the first rate case which occurs after the economies have been effected. This procedure seems to protect the public interest without depriving the utility of a fair rate of return. Yet, the knowledge on the part of a utility that any savings produced by additional effort and efficiency will promptly be taken away from it may discourage or prevent it from making such savings. Thus, in the end, the public may have to pay higher rates than it would have paid if the utility had received greater encouragement to be efficient. This problem deserves further study.

The Federal Power Commission has before it a number of questions, the answers to which are of vital concern to the entire natural gas industry. We have no desire or intention to maintain silence on any of these issues any longer than is necessary. Our policy is to let the industry know where it stands on all these matters as soon as we can.

GAS digests

On Oct. 16 we heard arguments in our Docket No. R-126 concerning the problem of accelerated amortization. Although this hearing was called for the purpose of receiving views bearing on accounting treatment of the matter, the greater portion of the hearing was devoted to the question of how accelerated amortization should be dealt with in rate making. We feel we have given everyone concerned ample opportunity to express their views and that there now is no reason for delaying an expression of the commission's views. Therefore, in the near future, the commission will state what course it will follow in regard to accelerated amortization in computing a fair rate of return.

The principal objection which has been voiced to the Hinshaw bill (now pending in Congress), insofar as I am aware, is that state regulation isn't as efficient as regulation by the Federal Power Commission, and therefore it is in the public interest to vest and maintain in the Federal Power Commission all possible regulatory power over natural gas companies.

I know a great many state commissioners personally and admire and respect virtually all of them. However, I have neither the wisdom nor the temerity to weigh the competence of their commissions against that of the FPC, and I don't know how this could be done, nor do I know who could do it. Questions of this kind must and should be decided on principle and not on personalities. Federal regulation of the natural gas industry has given the industry a stability without which it could not have accomplished the phenomenal expansion which has taken place in the last decade.

There are two ways in which a regulatory commission could aid in bringing about government ownership of the enterprises it regulates. It could deprive those enterprises of the revenue they require to render adequate service to the public, and thereby cause a failure of that service and a resultant demand for public ownership, as the only practical means of obtaining the service. Or it could permit the enterprises under its control to make excessive profits at the expense of the consumer and thereby breed a lack of confidence in, and respect for our government, which ultimately would result in a demand for a different kind of government, which would own the industries which had reaped the unconscionable profits.

Don't let minor objections kill AGA's public relations program

By **FRANK C. SMITH** • Houston (Texas) Natural Gas Corp.

YOU are well aware that there is a fifth area of mutual interest to producers and transporters of gas, to the distributing utilities, and to appliance and equipment manufacturers. That area is public relations. Several years ago GAMA adopted a public relations program and entrusted its administration to a well known firm of counselors. More recently, the Independent Natural Gas Assn., composed principally of gas transmission companies, including all of the principal ones in the United States, adopted a public relations program and likewise conferred responsibility for its administration upon another capable firm of counselors. Of our industry's family, the utilities alone have no adequate program, and it will hardly be necessary to argue that we who serve the public directly need it most of all!

Two years ago a special AGA committee to study a public relations program was appointed, with a former president of the association, Ernest R. Acker, as its chairman, and a representative committee membership. Last spring the plan resulting from the committee's long study was submitted, in an attractive brochure, to all AGA members, outlining its coverage of all appropriate avenues of public relations, its administration through AGA, citing its expected cost for the first three years at a total of $735,000, averaging $245,000 a year, and soliciting member company subscriptions, payable separately from AGA dues. In anticipation of its consummation and of a definite program of action to carry it through, GAMA and INGAA promptly agreed to coordination of the three association programs in order to achieve best results without duplication, conflict, or wasted effort.

Perhaps AGA's board of directors, in approving the proposed public relations plan and recommending participation and support to all our members, erred in assuming a general knowledge and realization of its desirability and worth. Many utility members have seen and urged its vital necessity. Yet, until this essential element of our industry's united program receives adequate pledges of financial support in addition to the general approval expressed, our industry-wide program of united effort in this field will be incomplete, for lack of financial support that is trifling in comparison to the benefits to be attained. No member's portion will be considerable, and in no case a hardship. Some difference of opinion has been expressed as to whether its cost should be billed as a portion of our association dues, or as part of the PAR contribution, or separately from both. This is a detail which should on no account be permitted to paralyze and nullify an essential activity. I earnestly urge every member company not already committed to support the public relations program, to review the matter, and, whatever its preference as to the method of payment, to join in its support for the initial three-year period.

At Wednesday's general session of this convention you will see and hear of some of the methods and results of GAMA's program and will note how effectively it meets the requirements of the appliance and equipment manufacturers. If our industry's individuality and character are to be identified, and if we are to be interpreted to the American public as an essential, dynamic, competitive public servant deserving public confidence, an action program of public relations, by and in behalf of the gas utilities, locally and generally, and designed to attain the goals of the AGA committee's plan, is essential to tell the story. I assure you that AGA's public relations program, when financed and undertaken, will be coordinated throughout with that of GAMA, and INGAA as well, so that the discharge of our great mission of public service and our welfare as public servants will not fail through lack of knowledge and sympathetic understanding by our millions of customers, and so that our place in the national economy will be understood by all whose understanding is essential to our welfare and progress.

Some utilities and some manufacturers, in their anxiety to make haste with the gas industry development program, have expressed impatience with its slow pace and lack of early results. There is no reason why every gas utility, which will, cannot set to work immediately, as many have already done, toward the accomplishment of the fifteen-point program. Appliance manufacturers may do likewise with their own, as many are already doing. Appliance sales promotion and merchandising, servicing, utilization and upgrading, and safety, are within the reach of every gas utility; and the complementary program is within the reach of every manufacturer. Every agency and function of AGA is directed toward service to its members in initiating and activating the Gas Industry Development Program. There is plenty of promotional material for companies ready to proceed.

Digests on these two pages were adapted from talks presented at the AGA convention.

GAMA consensus: better year ahead

By **JAMES F. DONNELLY**
Servel Inc., Evansville, Ind.

GAMA has recently completed a survey on industry thinking regarding 1953 and 1954 volumes.

Looking at domestic gas ranges, the industry consensus is that 1953 will be a little better year than was 1952. However, gas range manufacturers anticipate along with many other elements of the consumer durable goods field, slight fallings off in the second half of this year. These manufacturers also feel that under current conditions, 1954 sales volume will be similar to the volumes of 1952 and 1953.

Manufacturers of automatic gas water heaters feel that a relatively active first half will carry them through to a point well above two million units. Water heater manufacturers also feel that their sales also will taper off a little during the second half of 1953. Automatic gas water heaters, as an industry, are operating far above pre-war averages.

Gas-fired central heating manufacturers look for both 1953 and 1954 to be better years than was 1952. Not spectacular years, just better than 1952. They do not expect to equal 1950 volumes.

The results which I have just reported to you are the result of a consensus taken in June of this year. I believe that when the consensus is again taken in December, anticipated 1954 volumes will be considerably upped by manufacturers, and there is a reason—a big reason!

Manufacturers will recognize fully the true scope of the action program, and based upon what, by then, will be experience, will carefully weigh the anticipated effect as the program gains momentum and your individual markets become more conditioned for their sales efforts.

"The rapid increase in recognition, and the general use of this form of (cathodic) protection, clearly indicates that the mutual problems arising soon will reach the point where they can no longer be handled amicably through individual agreement. Because of the tremendous liabilities which may be created through lack of understanding, good practice, or standardization, the directed control of this work soon may become a serious concern of the entire industry."

There's trouble ahead if utilities fail to coordinate their corrosion control measures

By **HUGH L. HAMILTON** • A. V. Smith Engineering Corp., Ardmore, Pa.

THE subject of coordination of corrosion control is one that primarily suggests the mutual effect of an underground structure under corrosion control, with reference to other underground structures. In a corrosion control scheme that is applied to a so-called "grounded structure" there are mutual effects on any adjoining structure. The degree of effect on the other structure, or structures, is in direct relation to several electrical phenomena. The geometry of piping layout and the relation of the anode, ground bed or rails that is forcing currents into the earth is of first consideration. The electrical conductance of the soil and the protective coating applied to the structures, if any, will in large degree determine the proportion of interference effect as well as the physical extent of mutual effect. Last but not least is the amount of electrical current involved.

This interference effect will be noted on structures other than the one to which a corrosion control method is employed. The effect is that a degree of electrical current will find its way to the foreign structure, flow on this foreign structure and eventually leave to complete the circuit. If this unintentional current flow has no other path but the earth to follow, from the foreign structure to the home structure, then aggravated corrosion results. No corrosion will occur if proper steps are taken.

Generally speaking, if the total amount of electrical current under consideration is less than one ampere, no aggravated interference effect is to be anticipated. Many corrosion control currents may reach or exceed 100 amperes. This, then, points out the wide variety of current level. The field of influence of these currents that are caused to flow through the earth, and collect on a structure, can be of large magnitude. It is not unusual to notice this effect 10 miles distant from the source. Keeping in mind that one ampere of discharge for one year will dissipate approximately 20 lb of iron or 70 lb of lead, it is obvious why this is a critical matter.

The only manner in which this possible hazard may be held to an agreeable level is by the interchange of information regarding proposed or operating corrosion control devices. The usage of the word "coordination" is to indicate this exchange of information between neighboring utilities operating underground structures. A condition that requires coordination can be the result of stray traction current drainage and/or cathodic protection.

There has been a tremendous increase in the employment of corrosion control means. Transmission type mains with good electrical continuity, better application of improved protective coatings, and the test of time that such work is successful all have lent impetus. Greatly expanded facilities, increased operating pressures, cost of labor and materials all have demanded that more recognition be given to cathodic protection as a means of saving money and assuring supply. However, this inrush of activity has incipient hazards which management must consider.

AGA report DMC-53-3 presents data of particular interest in a consideration of the coordination problem. It should be noted that the cost of corrosion control is reported as a median value of $85,000 annually and that the total median cost of leaks due to corrosion and the cost of corrosion control is approximately $200,000 annually. These reported values are from 29 companies who returned questionnaires completed in sufficient detail to allow statistical analysis. It is also apparent from this report that the use of cathodic protection is increasing tremendously. We then are discussing a situation which is not only faced with greater employment but also one that involves the expenditure of many thousands of dollars.

It is our opinion that if greater consideration is not given to the proper coordination of corrosion control as to its effects on the properties of others some action might be sought in the courts. This can and should be avoided. Consideration for the property of others is all that is required.

It is not our purpose here to discuss the engineering facets of cathodic protection interference problems. The topic has been very well covered in other papers. A. V. Smith presented a paper at the 20th annual distribution conference of AGA entitled "Cathodic Protection Interference." This reference is basic and practical in its engineering approach and is highly recommended to those interested in pursuing the engineering solution. At the 20th annual American Petroleum Institute meeting, L. F. Scheerer discussed the subject problem and I would like to quote a paragraph from this paper:

"The rapid increase in recognition, and the general use of this form of protection, clearly indicates that the mutual problems arising soon will reach the point where they can no longer be handled amicably through individual agreement. Because of the tremendous liabilities which may be created through lack of understanding, good practice, or standardization, the directed control of this work soon may become a serious concern of the entire industry."

This statement is more applicable to the gas industry than any other industry

This article has been adapted from a talk presented at the AGA convention in St. Louis, Oct. 26-28.

employing underground pipe, because the gas industry has more buried plant than any other industry. The National Assn. of Corrosion Engineers published a report in 1951 by the Correlating Committee on Cathodic Protection. The AGA was a sponsor organization in this work and was represented by Guy Corfield, Southern California Gas Co., and F. J. McElhatton, Panhandle Eastern Pipeline Co. There were 11 sponsor organizations involved in the preparation of this valuable report. The report is very comprehensive, giving detailed suggestions for coordination of activity, addresses of established electrolysis committees, where to obtain maps, selected bibliography, etc.

There are many cases to our certain knowledge where the use of corrosion control has been employed with an apparent disregard for the rights and property of others. These matters have been discussed in detail with other corrosion engineers. They have involved situations where (1) stray current traction bonds have been installed without notification to others occupying the same area; (2) the installation of ground beds to be used in conjunction with a rectifier in which the ground bed has been located adjacent to another underground structure without notifying others of the installation; (3) the alteration of electrical configuration of a structure without notifying others of the change; (4) abandonment of a protective scheme without notification to others involved; (5) the wholesale installation of cathodic protection schemes where engineering design has not been adequately considered so that the desired result has been nullified after interference currents were considered.

These situations not only affect disposition but cause an unwarranted expense. A well planned installation is definitely the least expensive and most successful.

Many contributing causes

We feel that one or two, or a combination of causes, are contributory: (1) that the engineers performing the field work have not been thoroughly trained and advised of their responsibilities in regard to possible mutual effects; and (2) that management is pressing for completion of the work and not allowing the field engineers sufficient time to adequately consider the installations.

This press of time might result due to the apparent "out of balance" in engineering costs vs. total installation costs. The control of corrosion is one that involves what might be termed field research. Obviously, this is expensive engineering. However, the actual cost of a protective installation is usually of proportionately minor financial outlay. This may be one of the causes for a possible hurry-up management approach.

The proper training and advice on attendant responsibility is obviously of paramount importance. Unless improved coordination results are achieved, some difficult and arbitrary legislation might ensue. In pursuing this caution, some legal literature has been researched. In summary of these cases, it is apparent that potential defendants cannot with impunity permit stray electric currents to cause damage to pipes of potential plaintiffs. Preventive or corrective measures that are reasonable and practical must be followed. Unless these measures are followed the potential defendants are liable to those persons whose property they have damaged.

The unescapable factor, present in all these cases, which seems to be of paramount importance is that the courts recognize the damage caused by stray currents and will charge all the litigants with knowledge of potential damage. All liability in tort action is predicated first and foremost on a defendant's negligence. If a defendant is not negligent, he is not liable and conversely if he is negligent he is liable.

It then behooves all of us to take reasonable precautions in corrosion control so as not to be held liable. The cases studied conclusively establish that industry must take cognizance of the electrolysis problem, particularly as regards potential liability of corrosive damage to another's structure. If preventive measures are taken and they are applied in a reasonable and practicable manner there can be no problem. If the proper measures are not taken there can be a strong argument that all that was reasonable and practicable was not followed.

Rules not too stringent

Several states in the northeast region of the country have set up rules under their public service commissions. In these rules there are definite stipulations as to corrosion control measures to be followed when pipelines are constructed that are to carry gas in excess of certain pressures. At the moment these rules are not too stringent. However, the door has been opened on the subject and if further attention is called due to an unfortunate situation, more difficult rules are to be anticipated. As stated previously, this can and should be avoided.

A large eastern combination utility has taken positive steps in this direction. A top management committee was established to study and oversee the entire corrosion control program. Under this top management committee, there is established a working committee, consisting primarily of the engineers responsible for corrosion study. This then serves a dual purpose in that the entire corrosion picture is viewed from a management viewpoint and the field activities are carefully effected.

"To accomplish adequate coordination of corrosion control, the following steps are recommended:

1. Instruct properly trained engineers as to possible attendant hazards regarding the property of others.

2. Allow sufficient time for these engineers to thoroughly pursue the problem.

3. Explore new areas that are to be embraced by new construction to determine location of other underground structures and what, if any, corrosion control means are employed.

4. Notify your neighbors of:

- ***a. Planned cathodic protection schemes before installation so that interference tests may be conducted.***
- ***b. Installation of drainage bonds whether to another pipeline or traction rails.***
- ***c. The abandonment or alteration of any protective scheme by which they might be affected.***
- ***d. Changes in electrical configuration that would alter the protective design.***

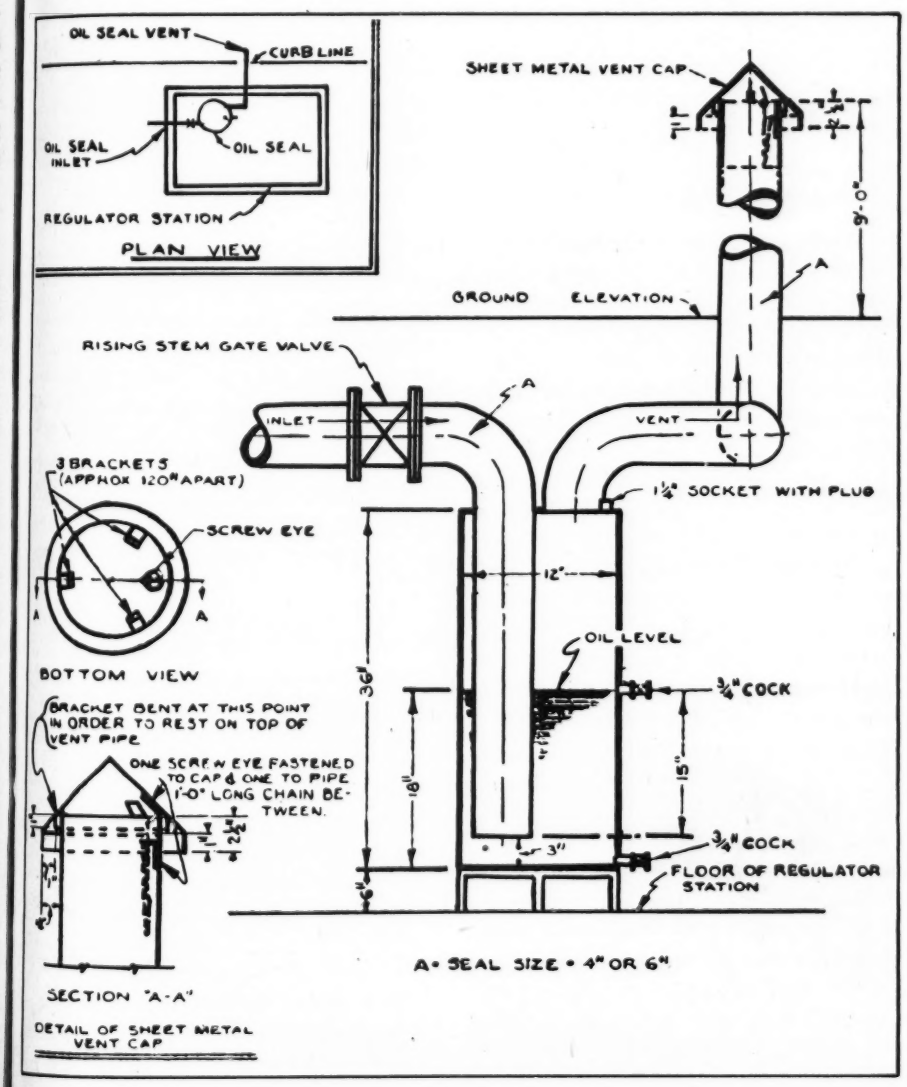
If these steps are followed, it is our opinion that adequate coordination of corrosion control will result."

OVER-PRESSURE PROTECTION

An AGA convention panel report

1. Oil seals for protection of distribution systems

By **HENRY W. PARKER** • Lehigh Valley Div., UGI, Bethlehem, Pa.



PRIOR to 1951 our use of oil seals was not very extensive. The low pressure sections of our territory had about one oil seal for every three or four regulator stations. The seals used were installed on the downstream or low pressure side of the regulators and consisted of a 3-in., 4-in., or 6-in. dip pipe in a 12-in. pot, with an initial seal of 15 in. of oil. The vents were the same size as the dip pipe. The vents were carried 8 ft above ground level and were topped with two elbows. The second ell was turned down and the open end was closed with a brass screen.

In December 1951 we had a practical, large-scale test of our relief equipment. There were heavy snows in the Lehigh Valley on Dec. 17 and 18 and temperatures were low. There was 10 in. of snow on the ground by the morning of Dec. 19. It was just 10° above zero at 8 a.m. Dec. 20, 1951. At noon of the 20th it began to snow again. The temperature began a rapid rise, the snow turned to sleet and then to rain. By early evening the temperature was up to 50° F and it was raining heavily. Our crews moved out to check and clear regulator stations right after the supper hour, but they were too late and their task was too great.

Regulators open up

Three of our many stations, one in Emmaus, one in North Bethlehem, and one in South Bethlehem, were completely flooded. The regulators at these three stations opened up and over-pressuring of the low pressure systems resulted. The Emmaus station was equipped with an oil seal which blew for a considerable period and a quantity of oil was lost. However, when pressures were returned to normal there was sufficient oil left to "seal off." In South Bethlehem the flooded station was not equipped with a relief. Seals blew at two other stations in this area. These seals were 2600 ft and

13,000 ft distant from the flooded station. Here, as in Emmaus, the blow extended over a considerable period and oil was lost from both seals. However, when pressures were returned to normal, there was sufficient oil remaining at the two locations to seal off.

Before the North Bethlehem station was cleared we took time for some pressure observations. Outlet pressure at the station during the trouble period was 42 in. of water. The only oil seal in North Bethlehem was 6500 ft from the affected station and it, of course, was blowing. In North Bethlehem, as at the other locations, sufficient oil was left to seal off when pressures were returned to normal.

Trouble calls from Emmaus and North Bethlehem were not too heavy. The situation was quite different in South Bethlehem. In all, some 1500 customers there were affected and had to be turned on when pressures were normal.

Protection inadequate

What did we learn from the experience of December 1951? Although there had been no meter installation trouble, customer appliance or customer property damage, we were convinced that the protection of our low-pressure distribution systems was inadequate. If we were to depend upon oil seals, these seals must be installed at or near every district regulator station. What should be the size or capacity of these seals? At what rate or rates of blow would they retain sufficient oil to seal off when normal pressures were restored? It was felt that these and other questions could only be answered by actual trial or experiment.

The question of the use of valves on oil seals was decided quickly. Instructions were issued to install valves on all newly installed oil seals and over a period of time, on oil seals already installed. Valves must be installed carefully so that unauthorized persons cannot readily operate them.

Metal vent caps

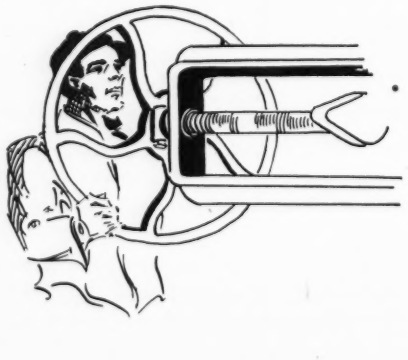
In our early experiments we removed the ells from the vent top and installed a metal vent cap. Two types of cone shaped caps were used. One had a sleeve fitting inside the vent pipe, the other fitted over the outside of the pipe. The latter type blew off the vent easily with even small amounts of gas flow and was adopted as standard.

After the early experiments we confined our efforts to tests on 6-in. seals (i. e., seals with 6-in. dip pipes and 6-in. vents). The size and detail of the pots varied.

On the first test with a 12-in. diameter pot and a gas flow of 18 Mcf/hr, pressure built up until the seal blew at about 16 in. The gas flow was gradually increased. Pressure at the seal inlet dropped as the blow progressed. Back pressure at the vent connection on the pot varied from zero up to 5 or 6 in. At a 36 Mcf/hr rate, traces of oil appeared as a mist in the blow at the vent outlet, and as the blow was increased to higher rates, small amounts of oil were blown-out. The blow was increased to nearly 60 Mcf/hr and held there for some time. Total oil loss was small. It was evident that even though blow at this rate continued for a long period of time, there would be ample oil remaining to seal off when pressure was reduced to normal. A subsequent test on this 12-in. pot was made with gas flow of 120 Mcf/hr. The seal blew at 18 in. and as the blow continued, pressure at the seal dropped to 5 in. Highest back pressure experienced at the vent connection was 6 in. This fell as the oil was carried out the vent. Practically all the oil was lost, with a sustained blow at this rate and there was no seal-off when flow was cut and pressure returned to normal.

16-in. pot tested

The next test was made with a 16-in. diameter pot and the 6-in. dip pipe and 6-in. vent. This test was started with some gas passing through a meter on a simulated distribution system. As with previous tests the seal was loaded gradually and blew at 18 in., this pressure falling off as the blow increased. Gas flow was increased gradually to 75 Mcf/hr and then held there. Nineteen Mcf/hr was passing through the meter and 56 Mcf/hr through the seal. Some oil was blown out at this rate. However, after a sustained blow, there was sufficient oil left for a 7-in. seal-off when pressures were reduced. Again the seal was blown, this time without the use of the simulated distribution system, and the rate of blow was increased to 86 Mcf/hr and held at that rate for a period. After this blow sufficient oil was left for about a 5-in. seal. A third blow was made, increasing the rate rapidly to 120 Mcf/hr. As with previous test at this rate, practically all the oil was lost but there was little or no back pressure on the pot and pressures at the seal fell off as the blow continued.



Baffles used

In an effort to retain sufficient oil for seal off after higher rates of blow, without excessive build-up on the seal, we constructed a 20-in. diameter seal pot with three horizontal baffles. When seal was blown and rate of blow was increased to 60 Mcf/hr and then held there, only about 5 in. of oil was lost, leaving a 10-in. seal when pressure was reduced. However, because of the baffles, the pressure at the seal increased as the rate of flow went up, reaching a high of about a pound. Back pressure at the vent connection was not excessive. A second blow was made on the 20-in. pot and the rate increased to 80 Mcf/hr and held there for some time. The baffles did not curtail the oil loss, for at the conclusion of the blow there was only sufficient oil left for a 4-in. seal.

At this point it became evident to us that with or without baffles, at high rates of flow, the oil is entrained with the gas and carried out. We changed the design of the pot, using vertical baffles ahead of a side vent connection and even used a series of "ring" baffles in one seal but the results were the same. We did not retain sufficient oil for seal-offs at rates of flow in excess of 60 Mcf/hr. Higher rates of flow with sufficient oil retention for seal off were established with smaller diameter pots without baffles.

As a result of our experience and the experiments already described, we have adopted the oil seal as standard relief for district regulator stations.

It is definite that seals must be installed at or near every regulator station to give adequate protection.

Use of straight vent and vent cap is standard practice since this reduces the hazard of a down blow.

A 12-in. seal pot without baffles is superior in performance to larger seal pots, with or without baffles.

In blows up to 60 Mcf/hr sufficient oil is retained to seal off after pressure is returned to normal. Our experience has

SHOULD COMPLETE SHUT-OFF BE USED TO PREVENT OVER-PRESSURE?

Pros

1. Shutoff valves are relatively small and therefore frequently require less space than other types of protective devices.

2. Shutoff valves often may be less expensive to install, especially on existing systems, because frequently they can be installed in existing facilities.

3. Complete shutoff of a station avoids the problem and possible hazard of disposing of gas released by relief devices.

4. Shutoff valves are relatively simple in design and operation as compared to monitoring regulators for a low pressure system. This is especially true if the monitoring regulator installation is designed so both regulators will be constantly in operation, thereby eliminating the possibility of the monitoring regulator sticking.

5. Shutoff valve installations probably are less susceptible to damage from external sources than are most regulator installations. This is true especially of the self-contained valves which do not have external control lines. External control lines on any type of shutoff should be protected against damage. The breaking of a control line will either render the device inoperative, cause it to open, or cause it to shut off.

6. Some shutoff valves are designed to operate at either high or low pressure. The low pressure shutoff provides protection against broken control lines and against repressuring a district where gas pressure has been low enough that the pilots may have been extinguished. Also, in case of gas shortage, which might prevail under some emergency conditions, the low pressure shutoff features of the valves would automatically close down districts as pressure reached the low safe point. Only the number of districts, therefore, which could be supplied by the available gas would be left on. This might, under some conditions, make it possible to continue service to a portion of a system rather than shut down entirely.

7. Maintenance of shutoff valves is probably less expensive than comparable programs for monitoring regulators or relief valves.

Cons

1. The complete shutoff of one station of a multiple-feed district might be serious under very heavy load conditions. The chances of this happening are extremely small. Furthermore, decrease in pressure in the district likely would be slow, giving reasonable time to make corrections after automatic or other warning devices have operated.

2. When two-stage regulation (as contrasted to single-stage plus a monitoring regulator) can be used without the outlet pressure of either exceeding the maximum safe pressure of the district, this is probably preferable to the use of shutoff valves. Two-stage regulation is particularly adaptable for protection of medium pressure districts supplied from high pressure sources.

3. Automatic shutoff valves are less desirable in single-feed districts unless the district is very small so that a complete shutdown would not be serious.

shown that most blows are at rates lower than 60 Mcf/hr and that reliefs will seal off after pressures are returned to normal.

If blowing rate exceeds 60 Mcf/hr, oil retention is not sufficient to seal off after return to normal pressure.

The 6-in. oil seal, that is 6-in. dip pipe and 6-in. vent, with a 12-in. diameter seal pot with initial seal of 15 in. of oil, will relieve 120 Mcf/hr or better without excessive back pressure.

We are standardizing our oil seal sizes at 4 in. for 4-in. district regulators and smaller and 6 in. for district regulators larger than 4 in.

As of Sept. 1, 1953, there are 46 regulator stations in the Lehigh Valley Gas Div. of the United Gas Improvement Co. Thirty-three of these stations are equipped with oil seals. Six stations, of small size, are equipped with mercury seals. These will be changed, in time, to the standard oil seals. Nine stations, not now equipped with seals, are scheduled to be protected soon with standard oil seal reliefs.

2. Complete station shutoff as a means of preventing over-pressure

By **GORDON G. DYE** • Southern California Gas Co., Los Angeles

PROPER design and installation and a sound inspection and maintenance program are necessary regardless of the type of protection used. Costs of such programs for the various types of equipment are not necessarily the same. On this page is a list of pros and cons on the shutoff question.

There are a number of different types of shutoff devices. Some are self-contained, with a control mechanism within the body of the valve and with a pressure rating in excess of the pressure upstream of the regulator. Others are of similar design, but with external static lines. This type usually can be set for both high and low shutoff.

Two employees of the Southern California Gas Co. have developed a shutoff valve (patent applied for) to be installed in the outlet piping of the dust filter which is in service upstream of the district regulator. This device usually can be installed in existing vaults without any expensive rearrangement of piping or change of equipment.

3. Mechanical relief devices

• By **DONALD J. MILLER**
Public Service Co., Denver, Colo.

MECHANICAL relief of over-pressure is provided by a valve device which opens at a predetermined and set pressure, preventing or minimizing pressure build-up by allowing gas to escape to atmosphere, and which throttles back to a closed position when and if the factors causing over-pressure cease to act.

There are probably four prevalent types of relief valves in general use in the industry. They are the dead weight, the lever and weight, the spring-loaded valves, and the back pressure regulator. Frequency of use is probably in the order as named. In all cases the gas pressure to be controlled is the medium which operates the mechanism, either by lifting a direct weight, by lifting a weight multiplied by a simple lever, by compressing a spring, or by causing movement of valves actuated by a diaphragm.

In general, the dead weight types are used for lower pressure ranges and are therefore applicable to protection of low or medium pressure systems, while the

spring and lever type valves are generally used in higher pressure systems. My discussion has been drawn from our own experiences, in which medium and high pressure systems are involved and for which we have pretty well standardized on the lever and weight relief valves. We have had no experience with back pressure regulators used as relief valves, although they have been used thus under peculiar situations.

Data enabling intelligent selection of type, size, and capacity of relief valves are available in the formulae, curves, and other data customarily supplied by the manufacturer. However, the basic information needed by the distribution engineer to analyze manufacturers' data must come from his own observations and his own considerations of the characteristics of the regulator station he is designing, and of the load area the station is serving, or will serve. If we limit this discussion to the function of a relief valve in preventing system over-pressure, it follows that the most important characteristic of the valve is its capacity to relieve gas. In our operations, this problem of building enough relief capacity into a regulator station is the most difficult phase of the general problem, since heating saturation is high and we have adopted the policy of using relatively few large capacity regulation stations in aboveground buildings.

I have seen written in a manufacturer's bulletin, obviously presented as a rule of thumb, that if a 4-in. medium pressure regulator is feeding into a 6-in. outlet line, a 6-in. relief valve should be used. Selection of size and capacity is not as simple as that. I have listed the factors which, in my opinion, must be considered in order to enable proper determination of relief capacity, together with brief illustrative remarks concerning each factor:

1. To enable complete relief protection, the safety valve should be able to pass the same quantity of gas that the regulator would pass under maximum conditions of failure or malfunction, minus the normal demands of minimum load. In most instances the use of gas during minimum load periods should probably be neglected. However, if a regulator is supplying a high load factor area, or if it is one of two or more stations supplying a common load area, gas used to supply minimum load might contribute effectively to need of lesser relief valve capacity. As an example, we have a situation in Denver* where five large stations, with capacities in range of 1 MMcfh each, are supplying a common load area consisting of downtown office buildings, apartments, and the like. Regulators in these stations are 8-in. low pressure balanced valve types. Regulator capacities are such that equal relief valve capacities would require rather formidable batteries of safety valves on common headers after each regulator. However, the stations are interlinked with mains of such capacity that load calculations indicate that failure of one regulator during an off-peak period and consequent build-up to its relief setting would lock up the other four regulators and blow their reliefs, and would considerably curtail deliveries from other stations. The combined effects of additional relief to atmosphere at other stations and of considerable increase in load supplied by the malfunctioning station very effectively reduced the relief capacity requirements at each station. The calculated resultant maximum main pressure from the posed problem above, where two 6-in. relief valves were located at the malfunctioning regulator and one each at the other stations, was twice the set pressure of the relief valves involved. This condition, of course, is considered highly unsatisfactory but can be remedied by adding relief valves to the affected stations. It should be noted here that the average 6-in. relief valve used on low pressure has only about one-sixth the capacity of an 8-in. balanced valve regulator with 50 psi on its inlet. During periods of heavy load, the effect of failure of one regulator would be to limit deliveries from the others to the extent that increased load supplied by the malfunctioning station should produce the same results.

2. On the other hand, a district regulator supplying an isolated load area should be backed up by relief valves capable of releasing all of the gas that a failed regulator would pass.

3. For any given relief setting, regulator capacity is determined by the difference in pressure between its inlet pressure and the pressure at which the relief valve should hold its outlet. The location of the district regulator with respect to high pressure supply sources has bearing on safety valve capacity determination. For example, the capacity of a regulator supplied by a high pressure line of large capacity will be little affected by safety valve blow-off, but if a regulator is supplied by a high pressure lateral, the capacity of which is limited by diameter or length or both, the reduction in inlet pressure caused by the artificial blow-off load can be reckoned with in determining regulator capacity.

4. Ordinarily the principal factor creating deficiency in relief valve capacity compared to that of the regulator is the relative difference in pressure across each unit. In our operations the ratio of differential across the regulator to that across a relief valve is seldom less than six or seven to one during normal system pressure operations. We try to reduce that ratio by seasonal lowering of our high pressure system and by setting relief valves at values as high as possible, consistent with prudent limitation of inlet pressures to which house regulators might be subjected.

After selection of a relief valve of the desired type and necessary capacity comes the problem of its fabrication into the station piping. As stated earlier, all of our stations are aboveground in building enclosures of appropriate size. Station inlet and outlet piping consists of two vertical risers. The regulator run of valves and piping is horizontal and is usually about 2 ft above floor level. The horizontal bypass piping is directly above the regulator run. The relief valve or valves are placed on top of the outlet riser.

I believe it is normal practice with most operators to prohibit use of a valve ahead of the relief assembly, but in our stations we install a valve in that position to simplify relief valve inspection and test. This valve is always a rising stem gate valve so that a casual glance will tell its position. All of our station repairmen and operators are instructed to try the valve for free movement at regular intervals. Most of our stations are automatic, but are checked regularly at intervals of a week or less, and it is a usual habit with our men to lift the valve off its seat every time they enter a station.

Relief valves are inspected and set once every six months on a routine basis at the time the station regulating equipment is inspected and overhauled. The pressure check on the relief valve is made by closing the gate valve ahead of the relief and introducing gauged air pressure from a portable compressor. An inspection sheet is made on each station checked with space for remarks as to condition, changes, and any other pertinent information about status of the station.

Several points of design are considered in the construction of relief vent stacks. They should, of course, have as short a gas path as possible with a minimum of ells. The vent cover design used in our stations is the conventional flap hinged on the metered stack end. It is considered bad practice to install stack terminal fittings such that they direct the exhaust gas downward. Installing water and snow traps in the vent piping and thus eliminating the vent cover has been favorably considered. Nothing of this sort has been tried in our stations, however.

*For another story on Denver's regulator station, see "Push-Button Controls Denver's Gas Pressure" by Everett M. Roark on page 33.

Everything's under one roof at Tulsa's new service center

District operating headquarters, meter shop, garage, general purchasing, and display and advertising departments, warehouse, and pipe yard are all brought together in this new Oklahoma Natural Gas Co. facility.

By FRANK CHAPMAN • Feature Editor

OUTSTANDING is the word for the Tulsa Service Center that has recently been completed and put into use by the Oklahoma Natural Gas Co.

Although primarily a warehouse and storage facility for the Tulsa district, the center is unique for the additional facilities that it offers. The building part of the center houses under one roof the Tulsa district operating headquarters, meter repair shop, the garage, general purchasing and display advertising departments, conference rooms and sectionalized recreation and lunchrooms, as well as storing facilities.

The yard area is used as a centralized pipe storage with access to outside pipe coating facilities, and auto and truck parking space. Construction work was started in October of 1952 and completed in August 1953. The centralized pipe storage brings together in one place what was originally stored in five different locations. Air and water hoses are installed in the parking area for automobile service purposes.

The site, which consists of 40 acres in suburban Tulsa, has access to arterial highways leading to the service area. A railroad spur parallels the yard.

The service center contains 63,000 sq ft of floor space and approximately 5600 sq ft of outside dock area. More than 100,000 sq ft of pipe storage area is provided for in the yard. The building is L shaped with provisions for adding more space as required.

The stores department occupies about one-third of the building. This section maintains an inventory of over $800,000 and handles over $225,000 in material each month. The entire stock is palletized and stored on pallet racks.

One of the many innovations in the service center is the use of abrasive type cleaning equipment for the reconditioning of regulators, valves and fittings.

Supplies are received at one end of the stores area and issued from the opposite end. In this way a straight-through flow of materials is realized. Counting and packaging equipment is built into the receiving area.

An area adjacent to the pipe storage yard is used by an independent company which does all yard pipe wrapping for the Oklahoma Natural Gas Co. A new 9-ton Unit crane is used in the yard for loading and unloading pipe.

The building boasts of a large combination recreation, conference and lunchroom that can be divided into three smaller rooms by folding doors. The small rooms are used for small conferences or group discussions.

Another room is outfitted with a variety of gas appliances and used as a classroom for instructing new employees and as a general appliance demonstration room. A portion of the same room serves as a foreman's gathering room.

Approximately 9000 sq ft of floor space is allocated to the meter shop where meters are repaired on a production line. Meters to be repaired are moved through the shop on a conveyor belt. Each of the repairmen along the belt has complete control over the movement of the belt at his bench. The shop is designed to handle 2000 meters a month.

All meters are handled in Cargotainers from the time they are received until they are shipped. The shop has its own fork lift truck.

All offices for the operating and general purchasing department personnel are located in the front two-story section of the building.

The display advertising shop located at the service center is designed and equipped for the production of all displays used throughout the six districts of the company. Window and floor displays are planned and produced here in connection with cooperative appliance sales activities for all gas appliance dealers in Oklahoma Natural territory, as well as the various display floors of the company's office building. Stage properties and displays used in connection with home service demonstrations and various employee meetings are also prepared here by the display department.

The display shop is equipped for the mass production of display material through the silk screen process, photographic reproductions, and through other modern display techniques.

The garage includes an automobile paint shop, wash rack, grease rack, and space for a body repair shop. Approximately 300 units are serviced and repaired in the garage. Provision is also made for maintaining special equipment such as tractors, compressors and ditching machines.

"SALES CLINCHERS" FOR GAS RANGE SALESMEN

No. 4 of a series

To sell her the *GAS* range, show her how she *SAVES* healthful food values with the...

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Full flame Starting Burner for quick boil or fast frying.

A full range of intermediate heats when wide spread of heat is needed.

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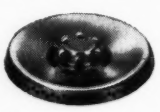

Click . . . a gentle "Keep Warm" heat . . . without further cooking.

**Write for names of ranges featuring ALLTROL Center Simmer.*

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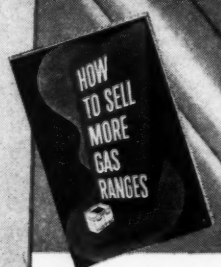

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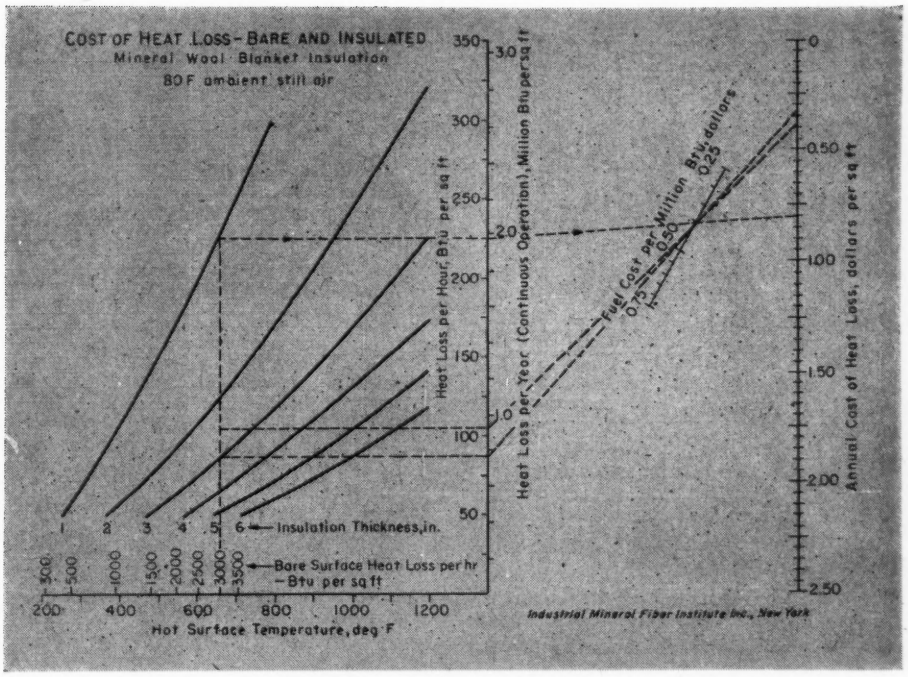
"ALLTROL CENTER SIMMER" MAKES GAS THE WINNER

ALLTROL® CENTER SIMMER

Calculating most economical thermal insulation thickness with a heat-loss graph


COST OF HEAT LOSS - BARE AND INSULATED
Mineral Wool Blanket Insulation
80 F ambient still air
Heat Loss per Hour, Btu per sq ft
Heat Loss per Year (Continuous Operation), Million Btu per sq ft
Annual Cost of Heat Loss, dollars per sq ft
Fuel Cost per Million Btu, dollars
0.25
0.50
0.75
1.0
Insulation Thickness, in.
Bare Surface Heat Loss per hr - Btu per sq ft
Hot Surface Temperature, deg F
Industrial Mineral Fiber Institute Inc., New York

DETERMINING the thickness of thermal insulation which should be applied on heated industrial equipment can be either very easy or very difficult. Standard thicknesses for various operating temperatures may be adopted for company-wide use, avoiding the need for reconsideration of specifications on each new job. On the other hand, the cost of insulating materials and installation may be weighed against the cost of heat loss to obtain the most economical insulation thickness under expected operating conditions.

The designer usually finds standard thicknesses are satisfactory when the cost of heat in a new installation is about equal to that on which the standards are based. However, when the cost of heat is unusually high or low or when a job is particularly large, a closer investigation of the most economical insulation thickness is certainly justified by the resulting savings in fuel dollars.

The heat-loss graph has been designed to help the engineer and specifier in determining the most economical thickness of mineral wool blanket insulation without requiring reference tables or repeated calculations. Hot-surface temperature and fuel cost per million Btu are fixed by the application, while the required data on materials and installation costs are obtained from insulation contractors or manufacturers.

To use the graph, start at hot-surface temperature on the scale at the lower left and proceed vertically to the given insulation thickness on the curves at left. A horizontal line through this point intersects the vertical scale in the center at both heat loss per hour in Btu per sq ft and heat loss per year in million Btu per sq ft for continuous operation (annual heat loss may be adjusted proportionately when operation is not continuous). Follow with a line through heat loss on the center scale and through cost per million Btu on the slanted scale to meet the right-hand scale at the approximate annual cost of heat loss in dollars per sq ft.

For each particular insulating job, hot-surface temperature and the cost of heat are constant, so that insulation thickness only can be varied (presuming that the type of insulation and finish remains the same). The engineer then selects two or three reasonable insulation thicknesses and determines with the graph the corresponding annual cost of heat loss with each. Knowing the difference in total installation cost between the various thicknesses, the specific operating cycle and the company's depreciation rate, the engineer can obtain the most economical insulation thickness. Of course, the graph can be used to determine heat loss alone, from both bare and insulated surfaces.

Example:

Assume an engineer wants to determine the most economical insulation

TABLE 1.

Insulation Thickness (in.)	Annual Cost of Heat Loss* ($ per sq ft)	Annual Heat Savings Over 1-in. Thickness ($ per sq ft)	Total Material and Installation Cost (Approx.) Over 1-in. Thickness ($ per sq ft)
1	.80	—	—
2½	.38	.42	.25
3	.33	.47	.40

*From graph.

thickness for a heated vessel operating continuously at 660°F and at a fuel cost of $.40 per million Btu. By applying the graph (as shown by the dotted lines) he obtains and tabulates the heat-loss costs for tentative insulation thicknesses of 1 in., 2½ in., and 3 in. He then tabulates the *added* cost (materials and labor) to provide 2½ in. or 3 in. as compared to 1 in. Thus, it is assumed in *Table 1* that 2½-in.-thick insulation costs $.25 more per sq ft when installed than 1-in. thick mineral wool blankets.

It is evident that 2½ in. is a more economical thickness than 1 in. since heat savings per sq ft are $.17 greater in the first year than the total added installation cost. A thickness increase to 3 in. saves $.05 more per sq ft each year but costs $.15 more to install than 2½ in. The added ½ in. of insulation (3 in. over 2½ in.) would take three years to pay for itself at the assumed fuel cost of $.40 per million Btu. Thus, selection of insulation thickness would in this case be governed by anticipated life of the tanks. Using the bare-surface heat loss scale at the lower left of the graph, it is evident that the bare loss at 660°F is about 3000 Btu per sq ft per hr (at 80°F ambient)—at a cost of about $10.50 per sq ft per year.

For reference:

Heat loss in plotting the graph is given by the expression

$$U = \frac{t - 80}{\frac{x}{k} + \frac{1}{c}} \text{ Btu per hr per sq ft} \quad (1)$$

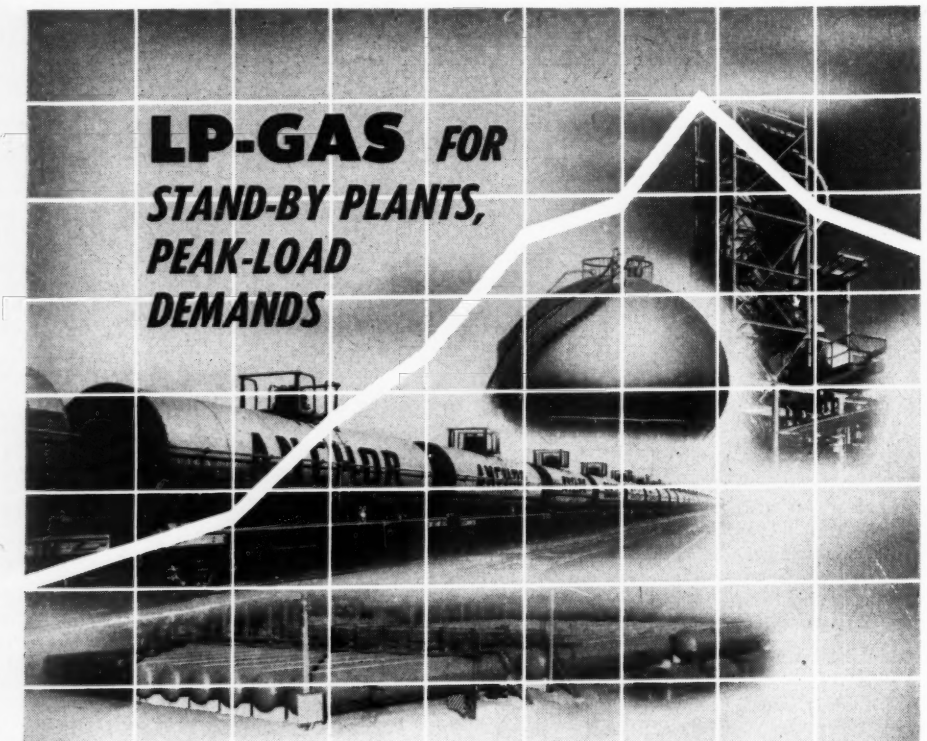
where t = hot-surface temperature (°F), 80°F = assumed constant ambient temperature, x = insulation thickness (in.), k = thermal conductivity of insulation (Btu per hr per sq ft per in. per °F), c = surface conductance factor assumed constant at a typical value of 2.

Thermal conductivity is given by

$$k = .252 + .00035t \text{ Btu per hr per sq ft per in. per °F} \quad (2)$$

representing typical design values for mineral wool blanket insulation at mean temperatures from 100°F to 600°F. Temperature of the outside insulation surface is assumed constant at 120°F in converting mean temperature to hot-surface temperature in equation (2).

Because of the several assumptions made, the graph cannot be expected to be more accurate than ± 15% although most results (with reasonable thickness of insulation) will be quite close to actual values. When the graph is used on a comparative basis, of course, much of the error is cancelled out.



Industrial Plants, Cities:

When dependability of LP-Gas supply is the important factor in choosing the supplier, look to Anchor. Anchor has the tank car fleet, the transportation knowledge and the sources to take care of your needs. Anchor's offices are located to give nation-wide service. So, before making contracts, Call Anchor First.

ANCHOR PETROLEUM COMPANY TULSA

SALES OFFICES: DES MOINES • OMAHA
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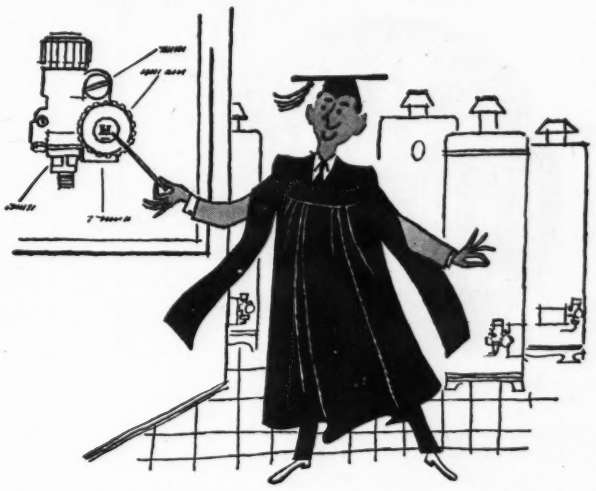
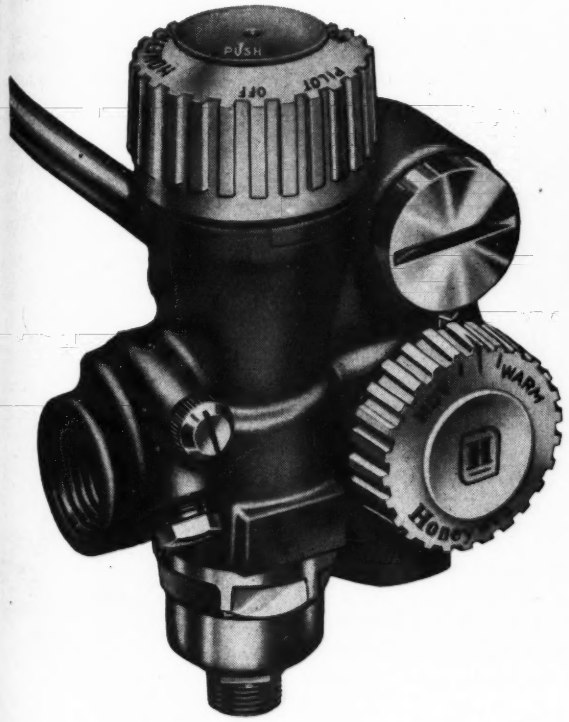
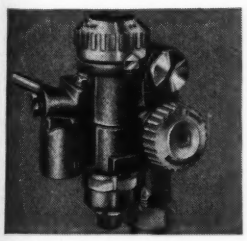
Only Honeywell gas water heater controls have these important extras!

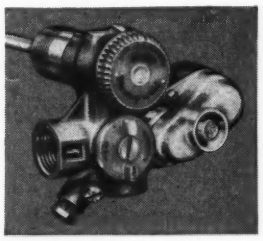




The "20"—Model V-5120 is the star performer in this big new line of Honeywell water heater controls. It provides *complete 100% control* for natural, manufactured or LP gas! Main gas cock with pilot position, main burner pressure adjustment and the thermomagnetic pilot with 100% shut-off are all included in this compact control.



The "21"—V-5121 is designed to take up minimum space for use as a concealed control. It includes main gas cock with pilot position; main burner pressure adjustment; thermomagnetic pilot with 100% shut-off.



The "19"—Use V-5119 for natural or manufactured gas. (Not for LP gas.) Includes thermostat; main gas cock with pilot position; pilot adjusting screw; main burner pressure adjustment; thermomagnetic pilot.

"Honeywell design" distinguishes these controls from all others! The world's leading manufacturer of precision controls—Honeywell—carefully designed these controls to maintain selected temperatures *constantly;* to light the burner *safely* and *automatically;* to provide "positive shut-off" in case of pilot failure.

Another standout feature of Honeywell Controls is the *rigid quality control test* each must pass before shipment. This assures that precision-made Honeywell Controls will give top performance when installed! Often this helps reduce the number of service calls received for minor adjustments.

You'll find Honeywell-equipped heaters have an *extra* sales feature, too! Prospects know the name Honeywell stands for quality and accuracy, and thus they're *easier to sell!*

Next time, order Honeywell-equipped water heaters! Then watch these *fast-selling, trouble-free* models boost your gas water heater profits! Call your distributor for all the facts—or mail the coupon below for literature.

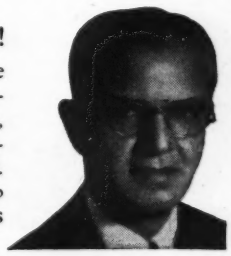
MINNEAPOLIS
Honeywell

H HONEYWELL

First in Controls

Another extra! Styled by Henry Dreyfuss!

Red and white dials plus smart styling give these new Honeywell Controls *extra* sales appeal! Nationally famous industrial designer Henry Dreyfuss, working with Honeywell, helped make these controls a smart, attractive addition for any water heater. That's why Honeywell-equipped models reflect top quality at first glance—stand out from other models on your sales floor.



MINNEAPOLIS-HONEYWELL REGULATOR CO.
Appliance Controls Division
8775 Mettler Street, Dept. GS-12-103
Los Angeles 3, California

Please send me detailed information on your complete line of gas hot water heater controls.

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Address.....

City..... *Zone*..... *State*.....

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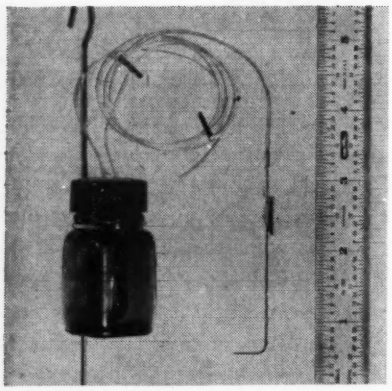

1 Precision Pens

Cannon precision pens, manufactured by L. J. Cannon Manufacturing Co., featuring controlled flow, are available from American Meter Co. in various types for all standard recording instruments and may be mounted on meters already installed.

Clear cut, distinct, uniform lines are produced. Pulsating flow, rapid pen movement, and atmospheric fluctuations have no effect, and the chances for errors through unrecorded intervals are virtually eliminated.

The pens are stainless steel and nonclogging. A continuous supply of ink is assured by capillary feed upward through a flexible plastic tube connected to a half-ounce reservoir suspended inside the recorder case, which protects the ink from dust and atmospheric contamination.

Complete kits are available from American Meter for field installation and American recorders may be equipped with Cannon pens as original equipment if desired.

American Meter Co.

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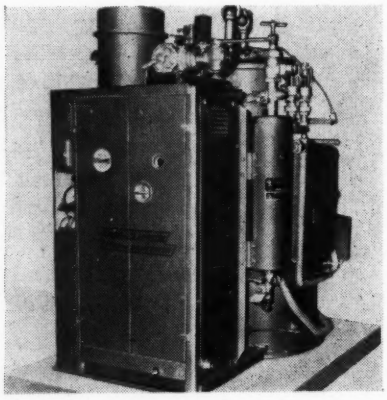

2 Steam Generator

A steam generator that can change from fuel oil to natural gas by flipping one switch and without interrupting steam output has been introduced by Vapor Heating Corp.

The fuel oil spray nozzle has been incorporated into the metal body of the gas burner. When the fuel selection switch is flipped from natural gas to oil, the motorized gas valve closes and the fuel oil solenoid valve opens, releasing oil under pressure to the spray nozzle. Fuel oil is always ready to be released to the combustion chamber because it is continuously circulated through the steam generator's hydraulic modulating controls. A constant spark and pilot light assure positive lighting.

Full working steam pressure is developed up to 300-lb pressure in less than three minutes from cold water. The generator makes 1500 to 5000 lb of steam per hour. Once the generator is started, automatic controls take over, causing the generator to turn on and off and modulate steam output to meet a changing steam demand.

Vapor Heating Corp.

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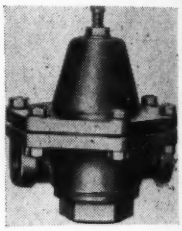
3 Reducing Valve

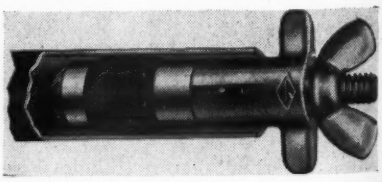


A new oil pressure reducing and regulating valve for reducing high pressure to low pressure has been announced by Eclipse Fuel Engineeriug Co.

Designed for the company's new series CF closed flame gas-oil burners, the valve is a single-seated, spring-loaded, direct-acting diaphragm type. It automatically reduces high pressure to low and maintains the low pressure regardless of fluctuations on the high pressure side. It is constructed so any restriction forces the valve wide open with a self-cleaning effect of the seat. The valve has a built-in strainer, which safeguards working parts and aids in surrounding the parts with a uniform temperature fluid to prevent sticking or seizing.

Eclipse Fuel Engineering Co.

■



4 Test Plug

Imperial Brass Manufacturing Co. is producing a new test plug suitable for use wherever it is desirable to shut off the end

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GAS, 198 S. Alvarado St., Los Angeles 57, Calif.

12/53 Fill in numbers of items in which you are interested.

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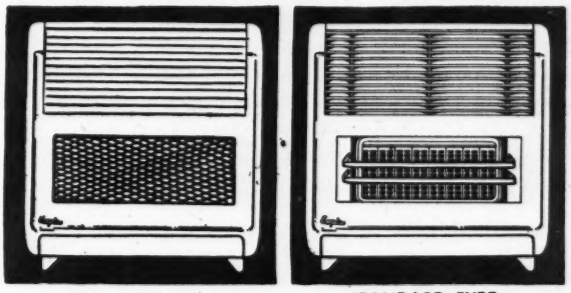
Step ahead with EMPIRE



NON-RADIANT TYPE STANDARD TYPE

BIG is the word for DEALER Opportunities

COOL CABINET TYPE

COOL CABINET *Gas* HEATERS
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STANDARD TYPE *Gas* HEATERS

1. Superior EMPIRE quality assures user satisfaction, protects your good name and good will.
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Add these up for a very unique PLUS in the heating business.

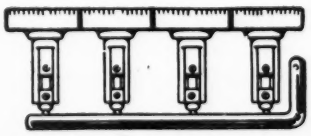
If YOU are sincerely interested in a profitable heating business EMPIRE offers EVERYTHING you could ask for.

"EVERYTHING" includes the broad and complete line of sizes and styles, and the service that keeps an active dealer making money, and the promotions and advertising support to put continuous POWER behind your business.

Never has the heating business been more flourishing, and never has there been a more promising opportunity for the EMPIRE dealer.

SILENT AS A KITTEN WITH AN EXTRA SET OF PADS

"Thriftmatic" Gas BURNER



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SEE YOUR REPRESENTATIVE OR WRITE DIRECT TO **EMPIRE**

EMPIRE STOVE COMPANY
BELLEVILLE, ILLINOIS
WORLD'S LARGEST MANUFACTURER OF *Gas* FLOOR FURNACES

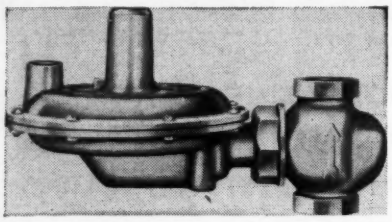
Empire a great name in Gas Appliances

of a tube temporarily. Reported to be especially convenient for use in instrumentation, radiant heat, refrigeration, L.P. gas, and similar installations, the new plugs make it possible to test tubing installations before they are put into service or when trouble-shooting for leaks.

The plug is inserted in the end of the tube and the wing nut is tightened, expanding the synthetic rubber portion of the plug and sealing the tube. The plug will hold pressures up to 100 lb. Five sizes are available: ¼, ⅜, ½, ⅝, and ¾ in. OD.

Imperial Brass Manufacturing Co.

■



5 Low Pressure Regulator

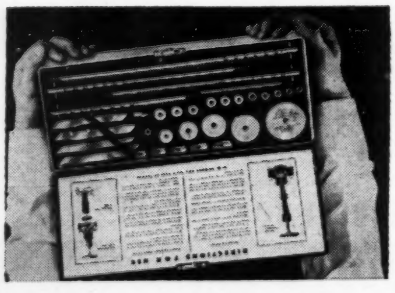
Designed for application where distribution systems are being converted from low to high pressures, the new Series 1400 Reliance regulator line for house or service low pressure installations has been introduced by American Meter Co.

Ease of installation and mounting in any position through incorporation of a union type removable pipe section is featured. The new units have been designed to stand up under rugged operating conditions with minimum maintenance, yet provide precise regulation over a wide range of flows and supply pressures. Maximum inlet pressure is 75 psi.

A large vent area is provided for emergency gas escape in case of excess pressure. Large, soft, standard regulator springs provide accurate setting of outlet pressure and prevent adjustment for excessively high pressures. The Series 1400 regulators are furnished with ¾-, 1-, and 1¼-in. standard pipe thread connections.

American Meter Co.

■



6 Valve Reseater Kit

The Skinner-Seal valve and bibb reseater is now available in a newly designed black and green fitted styrene case.

The new fitted case, according to the M. B. Skinner Co., provides individual wells and grooves, with part numbers stamped in each, for every item in the kit. It is designed to house either the 2-in. size tool for ½- through 2-in. valves and ¼- through ¾-in. bibbs, or the 3-in. size for ½-in. through 3-in. valves and ¼-in. to ¾-in. bibbs.

The tool provides a full range of guide pilots, cutters, spindles, tapered bushings, plus handwheel and bitt brace.

M. B. Skinner Co.

■

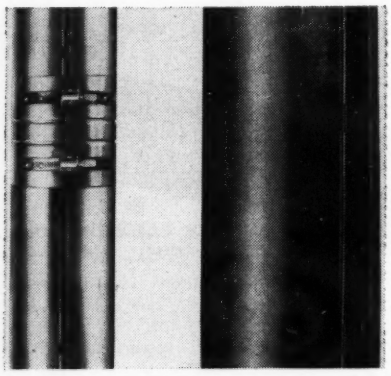
7 Fire-Retardant Paint

Particularly suitable for use in compressor stations, pumping houses, etc., a new fire retardant paint has been developed by Morris Paint & Varnish Co.

The paint, which is applied by brush or spray, is claimed to actually stop fire from spreading. When exposed to flame, Fyr-Kote pours out carbon dioxide and calcium chloride to smother the fire and retard the spread of flame. The oil base fire retardant interior flat wall paint has been listed by Underwriters Laboratories. It is reported that the paint will withstand more than 25 cycles of scrubbing.

Morris Paint & Varnish Co.

■



8 Pipe and Connector

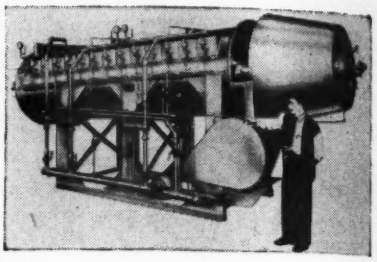
A new furnace pipe and a connector manufactured by Ralph Manufacturing Co. permit aluminum or galvanized pipe for furnace or ventilating use to be fastened rigidly to pipe or fittings without crimps or tools.

The new Jenkins Speed-Lok pipe is shipped nested in 5-ft lengths, requires little storage space. Hammering of seams is not necessary; a tab is located every 6 in. along the male seam. When the pipe is closed with the hands, each tab slides through a corresponding slot in the female seam. The tabs are bent over with finger pressure. The new pipe comes in 4-in. to 36-in. sizes.

The Tite-Air pipe connector may be used with other makes of pipe than Jenkins. It will connect tubing of sheet metal, plastic, fiber, asbestos, flexible steel or aluminum. It is available in sizes from 4 in. to 100 in. in aluminum, galvanized steel, heavy gauge steel, copper, and monel.

Ralph Manufacturing Co.

■



9 Retort Furnace

Three separate zones of temperature control are featured in the latest rotary retort furnace built by American Gas Furnace Co. External controls permit the operator to regulate the temperature at will in any one of the three zones divided about equally over the length of the furnace.

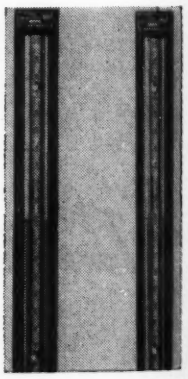
The furnace is provided with a pilot light at each burner, making it easy to light, eliminating the danger of unlighted burners, enabling the operator to complete furnace inspection at a glance, and making adaptation of safety devices a simple matter.

Featuring an improved sealing provision at the discharge end, the new furnace has greater work capacity through the multiplied heat input. Production of nonferrous metal parts is 1000 lb per hour, which can be regulated through the self-metering hopper and the variable speed of rotation.

American Gas Furnace Co.

■

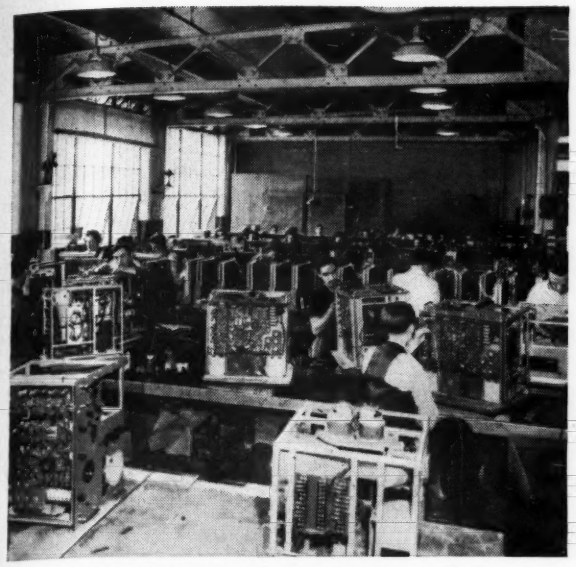
10 Cleanout Manometer



Two new lines of U-type cleanout manometers used in measuring pressure, vacuum, and differential pressure with line pressures to 100 psi have been introduced by King Engineering Corp.

Model BU has a glass U-tube with packings at the top, and is available in eight sizes from 6-in. to 50-in. ranges. Model BS has two straight glass tubes with packings at both ends and a cross connection in the lower head. It is available in 13 sizes from 6-in. to 100-in. range. In both models the tubes are protected by a rolled steel case.

Heads of either carbon steel and brass or stainless steel are available. The tubes are clear pyrex glass. Scales are graduated



INDUSTRIAL RELATIONS plays an important role in today's business scene. A well-planned program of job evaluation can result in better employee relations and improved production. One job evaluation study Ebasco recently completed was for an Eastern electronics company.

HOW SPECIALIZED SERVICES GO TO WORK FOR BUSINESS AND INDUSTRY

Ebasco engineers, constructors, and business consultants are right at home in this age of specialization. They render services to companies in many different fields . . . devote their talents to assisting these companies when special problems arise.

Throughout the United States and in many countries Ebasco undertakes diversified projects like those presented on this page for companies of all sizes, for long-established firms and new businesses.

It is very possible that Ebasco may be able to serve *you*. Our booklet, "The Inside Story of Outside Help," describes the full range of services we offer business and industry. May we send you a copy? Just write or phone Ebasco Services Incorporated, Dept. F, Two Rector Street, New York 6, N. Y.

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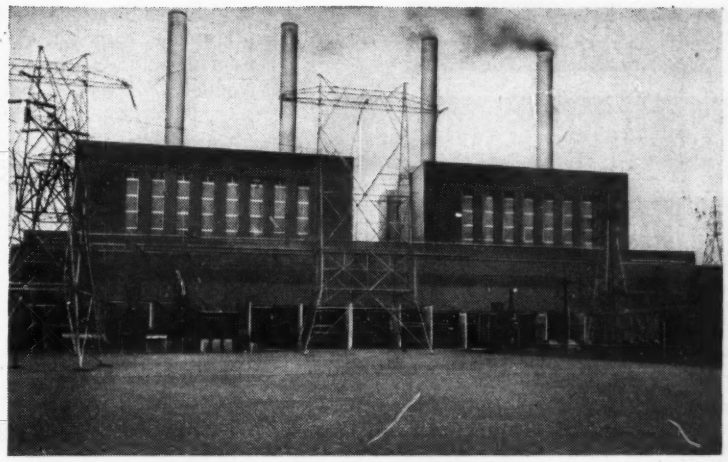
Ebasco Teamwork gets things done anywhere in the world

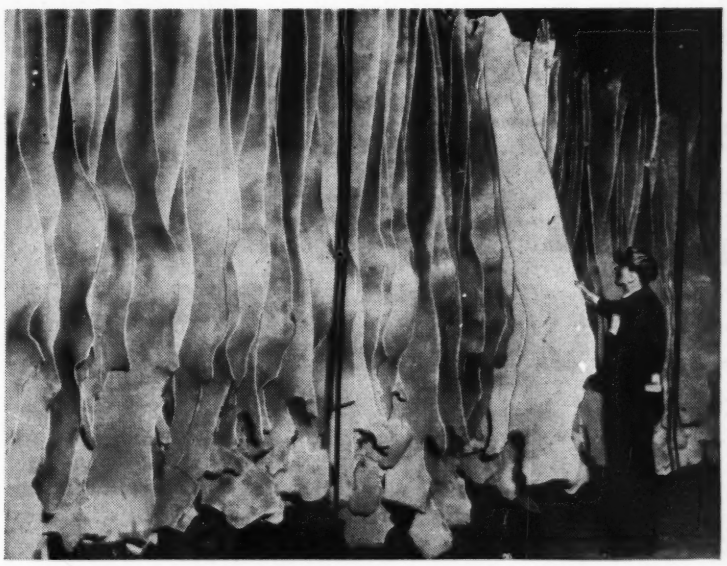


DESIGN AND CONSTRUCTION services are in constant demand by electric companies which provide dependable electric service throughout America. Ebasco handled the design and construction of the 375,000 KW Sunbury Steam Electric Station, shown above, for Pennsylvania Power & Light Co.

PENSION and retirement plans help attract new employees to a company and hold present ones. That's why more and more firms are installing them. Ebasco has prepared pension programs for many prominent companies in many different fields.

MARKET STUDIES are used by business and industry to provide a blueprint for sales and marketing programs. One such study made by Ebasco was of the effervescent teenage market—for one of the nation's largest manufacturers of soft drinks.

ENGINEERING SURVEYS often enable companies to reduce their production costs. Ebasco's engineering recommendations to a leather processing company, for example, resulted in abandonment of outgrown power facilities which were costly in manpower and space, and inefficient in the production of steam and electric power. This move produced annual savings many times greater than the cost of the survey.



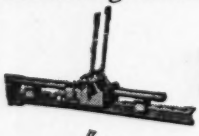
CUT COSTS

ON UNDERGROUND

PIPING JOBS

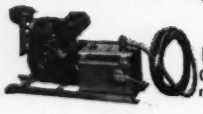
...with a GREENLEE PIPE PUSHER

Installing pipe underground is quick and simple this way. With a GREENLEE Hydraulic Pipe Pusher *one man* pushes pipe through the ground—under streets, railways, walks, lawns, floors. Saves time, cuts costs through elimination of extensive ditching as just a short trench accommodates the Pusher. No tearing up of pavement, lawns, floors... eliminates tunneling, back-filling, tamping, repaving. Cuts job time to a fraction. Pusher often pays for itself through timesavings on first job or two.



No. 790 GREENLEE PUSHER For 3/4 to 4-inch pipe. Six speeds—5,600 to 40,000 lbs. pushing pressure.

No. 795 GREENLEE PUSHER For pipe larger than 4-inch, concrete sewer pipe, large drainage ducts. Six speeds—25,000 to 150,000 lbs. pushing pressure.



POWER PUMP For both sizes of GREENLEE Pushers. Pushes pipe at rate of two feet per minute.

TOOLS FOR CRAFTSMEN

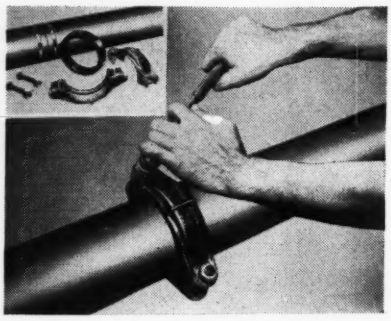
GREENLEE

Get facts on timesaving Greenlee tools now. Write Greenlee Tool Co., Division of Greenlee Bros. & Co., 1952 Columbia Avenue, Rockford, Illinois, U.S.A.

in inches and tenths and have a simple zero adjustment. Although normally suspended from the piping, these manometers can be mounted on a wall if desired.

King Engineering Corp.

■



11 Lightweight Coupling

The Gruvajoint, a new lightweight coupling for grooved pipe systems, has been designed for use where pressures do not exceed 500 psi. The couplings are easy to handle and store, can be installed quickly in close working areas, and make substantial freight savings possible.

Expansion and contraction, shock, ground motion, and vibration are automatically absorbed. The couplings remain leakproof under end pulls up to 7500 lb; permit layout misalignment up to 3°; withstand temperatures between 200°F and —65°F; and are suitable for permanent or temporary lines.

Green rust inhibitor protects the entire surface of these malleable iron couplings. The sealing gasket is of resilient synthetic rubber designed to resist the deteriorating effects of oil and chemicals. They are available in 2, 3, and 4-in. sizes.

Gustin-Bacon Manufacturing Co.

■

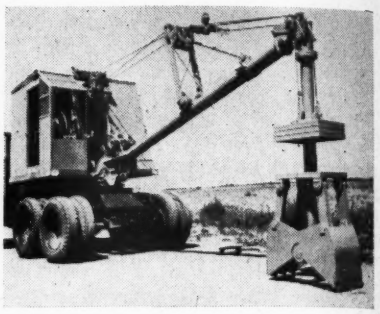
12 Trouble Lamp

A lightweight, explosion-proof trouble lamp, similar to a powerful flashlight, has been developed with a concentrated beam of light to assist maintenance work at hazardous locations where explosive gases or vapors are in the air. Designed and manufactured by Crouse-Hinds Co., the new type lamp consists of a cast aluminum cylindrical shaped lamp chamber, concentrating lens, composition handle, support hook, and explosion-proof cord connector with mechanical cord grip.

If an explosion occurs in the lamp compartment, flame-tight threaded joints located around the lens housing and along top and bottom sections of the lamp compartment confine explosion flames to an area within the lamp compartment.

Crouse-Hinds Co.

■



13 Digging Attachment

A new type of attachment for digging bellholes where hard-to-dig-in materials are a problem has been announced by the Quick-Way Truck Shovel Co.

The new attachment also serves as a materials handling bucket as well as a jawed grapple for picking up rubble, blocks of cement, pipe, etc. With a trench hoe boom, it digs to a depth of 10 ft or more when provided with extensions.

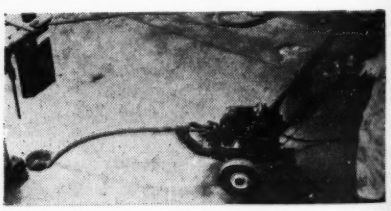
The bucket is suspended from a frame of which the hammer drive is a part. The hammer lifts and drops with a pile-driver action. As the bucket stands open, jaws spread wide, the hammer impact travels through coupling arms from the base of the hammer plate, straight to the teeth of the bucket, driving them into the surface to be penetrated.

The Quick-Way attachment digs a vertically walled hole, rectangular in shape. The surface hole is only slightly larger than the spread of the open bucket. Various size buckets can be furnished to meet requirements.

Quick-Way Truck Shovel Co.

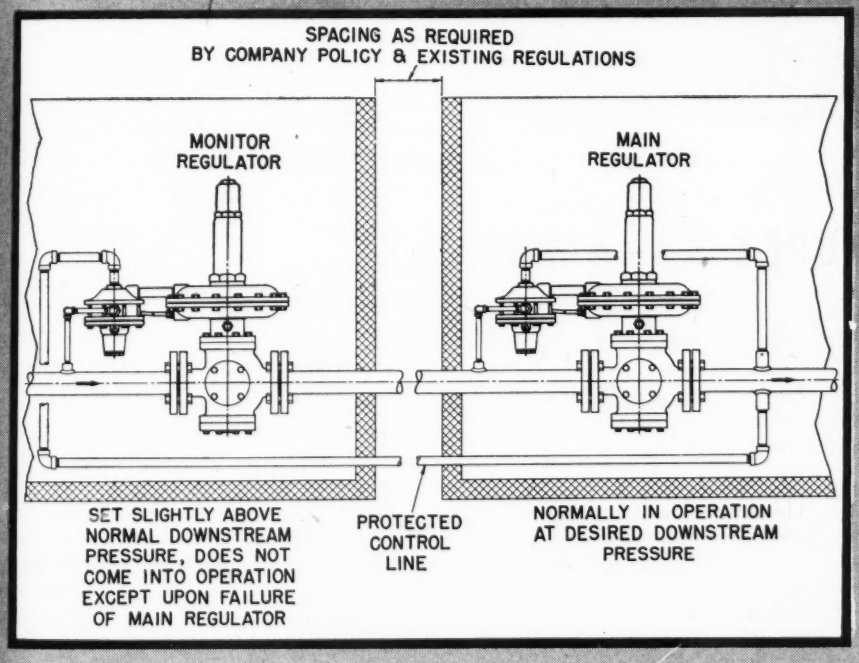
■

14 Pipe Cleaning Tool



Ohio Tool & Engineering Co. claims elimination of helixing and loss of cable in the line in its new sewer and gas pipe cleaning tool. The newly developed cable consists of a large diameter, heavy, spaced outer coil

SAFETY OVER-RIDE REGULATOR SYSTEMS



Essentially, an over-ride regulator system is one in which an auxiliary or "monitor" regulator assumes pressure control at a slightly above normal level in case the main regulator fails in open position. Object: SAFETY.

A typical arrangement, one of several to be considered, is shown here. Fisher Type 298 regulators are being used.

Fisher Governor Company can send you drawings showing many other types of over-ride regulator installations as well as the names of utilities using them. Allow us to help you solve your safety problems.

COMPANY • Marshalltown, Iowa

FISHER

BETTER GAS PRESSURE CONTROL

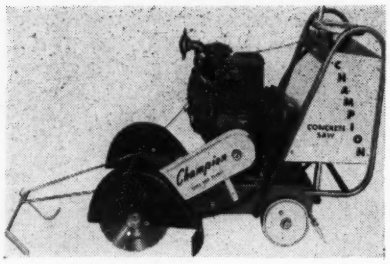
Since 1880

and a close wound, music wire coil of smaller diameter which is inserted inside the larger coil. The two coils are tied together at each end to form an integral driving member.

When extreme torque is applied, the outer coil tends to increase in diameter while the inner coil decreases. One coil has a tendency to helix in one direction, the other in an opposite direction, thus balancing the forces causing the helix.

An instantaneous snap lock is used so that cable can be made in short lengths and added as needed. Manual handling of cable while in operation is eliminated. The power unit has a motor that will deliver up to ¾ hp.

Ohio Tool & Engineering Co.



15 Concrete Cutting Saws

Two new concrete cutting saws designed for cutting all types of asphalt and concrete highways and streets and for cutting joints in concrete flooring and patching and trenching work have been announced by the Champion Manufacturing Co.

The CS-500 (illustrated) is equipped with a 14.6-hp, air-cooled gasoline engine, has dual blade guards with 14-in. blade capacity. The CS-400 has an 8.4-hp air-cooled gasoline engine with each blade guard having a 12-in. blade capacity.

Both machines have dashboard controls, positive screw feed, depth lock, non-swaying rubber tire wheels. The positive screw feed allows the operator to lower the blade into the cut or remove it with a minimum of time and effort. Both models have an instant water cut-off valve.

Champion Manufacturing Co.

■

16 Gas Fired Boiler

Among the new lines of boilers and furnaces now being manufactured by Scott Newcomb Inc. is the gas-fired boiler pictured here. Designed to supply sufficient heat for a six-room house, the boiler features convenient, automatic controls. Slightly larger boilers are available for larger homes and commercial and industrial establishments.

Sections are made of cast iron with integral baffles, providing long heat travel and maximum absorption before reaching the stack. Wet base design affords maximum heat transfer differential at the point of highest heat concentration.

Scott-Newcomb Inc.

■

MAKE JOINTS

WITH A RATCHET WRENCH

McWANE-PACIFIC SUPER DELAVAUD

MECHANICAL JOINT CAST IRON PIPE

Mechanical Joint has rapidly become the leading type joint for cast iron pipe for water or gas. A McWane-Pacific Boltite mechanical joint pipe line can be laid fast by untrained workmen, using only a ratchet wrench to make the joints. No lead pot, no calking tools.

The Mechanical joint is designed on the stuffing box principle—a thick rubber-compound gasket, triangular in cross section, being compressed by a bolted gland or follower ring. The joint is bottle tight, but flexible to allow settlement, expansion or contraction of the pipe line. Mechanical joints are interchangeable with fittings, valves, hydrants and pipe made by all leading manufacturers.

For complete information, wire or write McWANE CAST IRON PIPE COMPANY, Birmingham, Alabama, or PACIFIC STATES CAST IRON PIPE COMPANY, Provo, Utah. (Sales Offices in principal cities.)

McWANE PACIFIC PIPE Lasts for Centuries

Trade Literature

17 Crane and Shovel Information

In addition to describing Schield Bantam's new crawler and carrier, the company's new four-page newspaper, "Bantam City Press," contains coupons offering to construction machinery users services such as "how-to-do-it" information on various job applications and specification bulletins on the company's line of truck or crawler-mounted power cranes and shovels. Latest factory production techniques and unusual Bantam machine applications are also presented.

Schield Bantam Co.

■

18 Testing Equipment Bulletin

Schutte & Koerting Co. has issued a bulletin telling how new nondestructive testing equipment and techniques and a sound qual-

Names of Automatic Gas Water Heaters which are now equipped with UNITROL by *Robertshaw-Grayson* read like the blue book of American manufacturers.

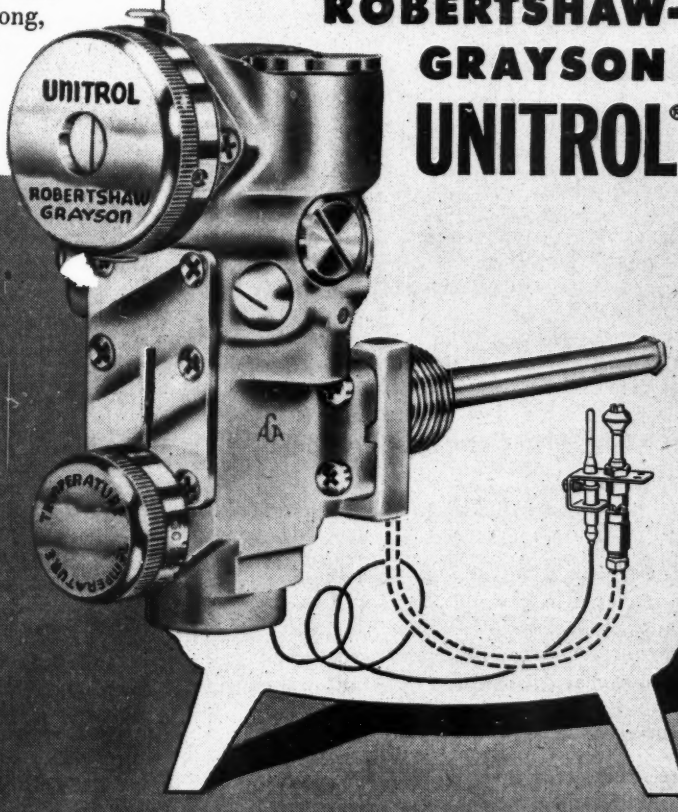
For the quality of water heater performance depends on the quality of the controls performance.

Everywhere, plumbers, dealers, gas utilities, consumers have learned that when the automatic gas heaters they buy are equipped with UNITROL they can expect — and they will get — long, dependable top-quality service.

It's a MARK of QUALITY

ON AN AUTOMATIC GAS WATER HEATER

ROBERTSHAW-GRAYSON UNITROL®



ROBERTSHAW®-GRAYSON

UNITROL

Main gas cock • thermo-magnetic automatic 100% safety pilot control • snap-action-thermostat • pilot adjustment valve • all in one simple unit.

Large pilot filter • All parts removable from front • Control can be removed without breaking water connections • Water leaks cannot enter gas line or vice-versa • All parts impervious to gases and immune from corrosion

The most beautiful control in America

Robertshaw-Fulton®

CONTROLS COMPANY

ROBERTSHAW THERMOSTAT DIVISION · Youngwood, Pennsylvania

GRAYSON CONTROLS DIVISION · Lynwood, California

ity control program are helping to provide equipment to meet increasing pressure and temperature requirements. The six-page illustrated bulletin describes in detail the magnetic particle and radiographic techniques used by the company.

Schutte & Koerting Co.

■

19 Compressor Booklet

A new six-page, two-color booklet describes Davey Compressor Co.'s Super Chief 315-500-600 cfm models. Each model is illustrated in 4-wheel and skid trailer-mounted units. Model 315 in both gasoline and diesel engine units is described, while models 500 and 600 are listed in diesel-powered units only. Complete specifications are listed along with air requirements table for air tools.

Davey Compressor Co.

■

20 Engineering Catalog

A 24-page brochure, Catalog No. RC-8523, has been issued by Fluor Corp. Covering engineering and construction activities in the petroleum, chemical and petrochemical fields, the brochure contains photos and descriptive material on gasoline plants, refineries, petrochemical process plants, catalytic cracking units, and compressor stations. The various applications of cooling towers, air-cooled heat exchangers, heavy-duty mufflers, pulsation dampeners, and gas cleaners in petroleum and petrochemical process plants are illustrated.

Fluor Corp. Ltd.

■

21 Multiport Valve Chart

A desk-size, flexible plastic chart showing the port and stop arrangements of Nordstrom multiport valves has been issued by Rockwell Manufacturing Co. On one side of the chart are diagrammatic sketches of four types of multiport valves, each with revolving two-color plastic discs attached to the center to illustrate the fluid traffic control obtained in the various types of multiport valves. The other side illustrates with smaller diagrammatical sketches the numerous other positions possible with different multiport arrangements.

Rockwell Manufacturing Co.

■

22 Analyzer Folder

Sections on how the paramagnetic principle works, how Leeds & Northrup applies this principle, and how the resulting signal is handled by the Speedomax recorder are featured in a new eight-page folder on the company's line of magnetic oxygen analyzers. Other sections deal with applications, performance, and specifications.

Leeds & Northrup Co.

■

23 Food Service Film

In the interest of better food service, the G. S. Blodgett Co. has prepared a 20-minute, full color educational film entitled "Recipe for Profits." The film, narrated by Lowell Thomas, covers such subjects as getting the most out of an investment in a sectional oven by using it for baking, roasting, and general oven cookery. Stressed is the importance of utilizing each square foot of floor space and the benefits of using vertical rather than horizontal space.

G. S. Blodgett Co.

■

24 Flowrator Meter Bulletin

"An Introduction to Flowrator Meters" is a 16-page catalog describing Fischer & Porter's Flowrator meters for flow rate measurement of liquids and gases by the variable area method. How the variable-area meter works, its basic flow equation, information on calibration scales, metering range, permanent pressure loss, upstream piping effects, viscosity effects, purging, and pulsating flow are all discussed.

Fischer & Porter Co.

LARGE CAPACITY... PERMITS SMALLER, LESS EXPENSIVE CONTROLS

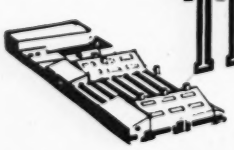
THERMAC ALUMINUM ALLOY GAS SHUT-OFF VALVE

1. GREATER STRENGTH AND RIGIDITY
2. HIGH STRENGTH, HEAT TREATED ALUMINUM ALLOY
3. EXTRA CAPACITY LOW PRESSURE DROP
4. NON-CORROSIVE
5. LOW COST
6. AGA CERTIFIED

A new idea in valves—the most revolutionary improvement in gas equipment in 40 years. So outstanding is this free-flow, low pressure drop shut-off valve, that appliance manufacturers are recalculating and redesigning their manifolds using smaller regulators and controls with savings up to $10.00 per unit.

Here's the secret: the valve plug is much larger than usual so that the gas passageway is not "pinched" down. Get a sample and check it for yourself.

In strength, this specially heat-treated, aluminum alloy valve exceeds anything yet built. The valve rotor is treated with a long-life lubricant. It's AGA certified and built by Thermac, an age-old name in gas controls. Send for sample and bulletin today. Available in ½" and ¾" pipe sizes.



THERMAC HM COMPANY

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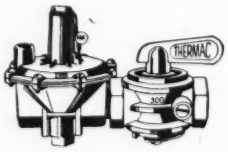


Order the assembly of Thermac regulator and shut-off valve to your own specifications.

Only GAS Does So Many Things...So Well
Gas is indeed the ideal fuel for a clothes dryer! It's faster, more dependable, more economical! Every day thousands of homes enjoy the wonderful labor-saving advantages of a clothes dryer. When you buy your new one, make sure it's GAS, and get the finest in gas dryers—CALORIC—because
Only Caloric Does So Much With GAS
Caloric "LO-HEET, HI-BREEZE" drying principle insures high speed drying with absolute safety. In fact, this perfect combination of safe, low heat and high-volume air flow is a guarantee that anything that can be safely washed in a washer, can be safely dried in a Caloric dryer—and fast!
No other dryer offers you more outstandingly improved features than Caloric! Waist-high lint screen for easier cleaning . . . sturdy drop-door for easy loading and unloading . . . beautiful porcelain-enamel and Nupon, the newly-developed wonder finish . . . are just a few of the many reasons why—
When you buy your new dryer, make sure it's CALORIC and it will be GAS!
Caloric®
CALORIC STOVE CORPORATION, TOPTON, PA.

Only CALORIC does so much with Advertising!

The above ad ran in two colors in the November 23rd issue of Time magazine. It is one of a series in which Caloric not only sold the virtues of the Caloric line of gas ranges and the Caloric dryer . . . but, *heavily emphasized the advantages of gas as a cooking and drying fuel!* We of Caloric are proud to be able to contribute to the great future of the Gas Industry . . . by maintaining the largest national advertising budget in the gas range industry for the past eight years . . . and by developing the Dione Lucas Gas Cooking TV Show available to all gas utilities throughout the country!

Caloric® CALORIC STOVE CORPORATION, TOPTON, PA.

Millions of users agree—

you cut more pipe with less work

with RIDGID

Heavy-Duty Cutters

There's a big difference in pipe cutters—and you're sure of it the first time you slap a RIDGID on a pipe (any kind) and see how easily cleanly it rolls through the metal. Beautifully balanced for easy action. Factory tested for perfect tracking—and guaranteed warp-proof housings of special malleable hold it. High alloy thin-blade or heavy-duty cutter wheels that leave practically no burr. You cut pipe fast with least effort. Ask your Supply House for the more-for-your-money RIDGID.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

RIDGID

Work-Saver Pipe Tools

Thermally Thinking

Continued from page 28

months of the period of 7.5% and decreasing to 6.4% as of October 1951, and that at the latest date shown by the record, July 1951, the yield varied from 3.5% to 6.4%. The commission also found persuasive evidence as to the cost of equity capital in the experience of Colorado itself. . . ."

One judge (Bratton) disagreed with his two colleagues on a procedural point. He said he thought that the FPC was in error in omitting the intermediate decision of the hearing examiner. The majority, however, held that the commission was within its discretion in dispensing with the filing of the examiner's report in a case of this kind.

Was Panhandle out of order?

Observers here think it is almost certain that Panhandle Eastern Pipe Line Co. will appeal to the full Federal Power Commission the decision of an FPC presiding examiner that Panhandle and the Southeastern Michigan Gas Co., of Port Huron, Mich., have violated provisions of the Natural Gas Act because of the arrangement by which Panhandle has been supplying natural gas to the Mueller Brass Co. at Port Huron, with deliveries being made by Southeastern Michigan under a transportation agreement with Panhandle.

The presiding examiner also ruled that Panhandle's maintenance of priority of service for some of its direct sale industrial customers different from those set forth in its filed tariff and rate schedules is unduly discriminatory and unlawful.

In his ruling, the examiner pointed out that even though there is a continuous and uninterrupted flow of natural gas in interstate commerce from Panhandle's interstate pipeline system to the Mueller plant, neither Panhandle nor Southeastern has obtained appropriate authority. He also declared that Southeastern has not filed a tariff, rate schedules and service agreement covering its transportation service for Panhandle.

The second part of the ruling relates

to contracts to direct sale industrial customers which contains a so-called "superior" interruptible provision. The ruling held that this provision gave direct sale customers a preference by permitting them to be the last of all interruptible customers to be curtailed or cut off when it is necessary for Panhandle to interrupt or curtail all interruptible customers in favor of its firm resale customers. The examiner concluded that the contracts which contain this so-called "superior" interruptible service provision unduly discriminates against Panhandle's resale customers who buy gas under the "I" (interruptible) schedules, and create an undue preference for all direct sale customers who have them. The examiner further states that these contract provisions are in violation of the Natural Gas Act, and that Panhandle's practice of making contracts for the so-called "superior" interruptible service is unlawful.

Matters for Management

The coalmen are disturbed

The board of directors of the National Coal Assn. has seen fit to express alarm once more over the rapid depletion of this "valuable resource" (gas) and has urged that FPC refuse to issue certificates of convenience and necessity for pipelines that will serve gas for boiler fuel or other "inferior" uses. At the same time, the board recorded its "support" of the gas industry's efforts to get a fair field price, in order to "slow the rapid exhaustion of this limited resource through uneconomic uses for inferior purposes."

There's nothing particularly new about the coalmen's stand. It's interesting to note, however, that the position of these two formulae for conserving gas, relative to political policies, have shifted considerably in the last couple of years. There was a time when "end use" control would have been popular with several now departed commissioners, simply because it *was* a control. Fair field price, on the other hand, was anathema. Today's commission would probably come closer to reversing the situation — although not close enough,

Continued on page 76

RIDGID
Is Work-Tested . . .
It Leaves the Factory

. . . to make sure
it gives you the
Best and the Most
wrench service for your money

The reason RIDGID Heavy-Duty Pipe Wrenches are known for the brutal punishment they can take is because of the toughness built into them, checked part by part and then hard work-tested when assembled . . . not just one wrench in 100 or 1000 but *every last one!* . . . Add the guaranteed repair-free housing, no-slip no-lock jaws, handy pipe scale, easy spinning adjustment nut and comfort-grip I-beam handle and you see why genuine RIDGID gives you the big value for your money. Buy them at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

RIDGID
Work-Saver Pipe Tools

Thermally Thinking

Continued from page 75

as far as fair field price is concerned, to please the producers.

So the resolution will probably have little effect on the situation.

Maybe the only real significance in the coalmen's stand is the tacit admission that their fuel is "inferior." There was not even a suggestion, in their resolution, that natural gas should be barred from coal-producing states. This old line has apparently been dropped; and, particularly on the househeating load, they've thrown in the towel.

The oilmen will fight

Not so the oilmen. Just because they're in a losing battle has not deterred them in their efforts to hang on to what they can. In the New York area, where the local utilities have been swiping the househeating load in basketfuls, the Oil Heat Institute of America has brought out an impressive "OHI Treasury of Advertising." An attractive plastic-bound, heavy cover portfolio with pocket pages, it has been distributed to dealers to teach them the how's and why's of advertising. There's a wealth of material in it, and if the dealers take its message to heart the gas utilities may be in for a fight. Not only in New York, but throughout a large territory where the institute has members.

Dealers, surprisingly enough, have not been sold on the value of advertising, according to the institute. If the brochure does its job, gasmen may lose an advantage that many probably did not know they enjoyed.

Progress in plastics

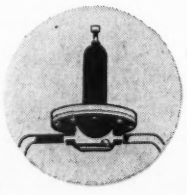
There's a little progress to report on the activities of the plastic pipe subcommittee of the AGA distribution committee, at last.

Soon after the subcommittee's exciting session at the distribution convention last spring, it was decided to take steps to find out what utilities wanted and what extruders could produce in the way of plastic piping. Questionnaires were to be prepared by the subcommittee as a means of obtaining the required expressions from the utilities, and once the information was in and assembled, extruders were to be given the results. They, in turn, were to make their recommendations in reply.

The personnel switch at Southern California Gas Co. that sent Chairman Gordon Dye to a division manager's desk, and the usual red tape attendant upon the creating of a questionnaire, having it approved all around, and sending it out, necessarily delayed action. But now, with Guy Corfield of SoCal having been selected to replace Mr. Dye and everybody having put their blessings on the questionnaire, the job is well under way.

What do utilities want in plastic pipe, from the standpoints of pressure requirements, temperatures, sizes, soil conditions, and types of gas to be served? These are the questions for which answers are being sought.

Perhaps by the time the next distribution conference rolls around, the industry will have something specific and concrete to tell the extruders, and the program will really start to roll.



ARCCO
LIQUID GRAVITOMETER
NOW 5 MODELS
Indicating Transmitting Liquid Gravitometer
...for pipelines, gasoline and chemical plants, refineries, etc.
Ruggedly built for hard field use but with laboratory accuracy, the long accepted ARCCO-Anubis Liquid Gravitometer with all its splendid features is now available for recording, controlling, indicating, transmitting, or various combinations of these functions. Write us fully about your application and request Bulletin No. 111 Revised.
1. RECORDING LIQUID.
2. INDICATING TRANSMITTING.
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4. RECORDING TRANSMITTING.
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AMERICAN
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3113 E. 11th St. • Los Angeles 23, Calif.
SEND FOR BULLETIN 111 REVISED

Current Reading

AUTOMATIC CONTROL OF HEATING AND AIR CONDITIONING—by John E. Haines. Published by McGraw-Hill. Price: $6.75. The application of automatic controls to a wide variety of specific heating and air conditioning applications is undertaken in this book, and in each instance the method of control employed and the manner in which it operates is detailed and described fully.

The electric and mechanical essentials of control systems are discussed and the fundamental background of the various methods of developing means of control are outlined. A glossary of terms used in control systems is a part of the introductory section.

Specific applications of the principles are also covered. Electric and pneumatic control circuits are outlined for a variety of applications. The electric circuitry of automatic control is taken up as a part of this discussion.

A wide variety of controllers for measuring temperature, humidity, and pressure changes are described, and the method by which they signal for corrective action is shown. Actuators which control the conditioning equipment in response to the operating controls are also described. A similar description is made of pneumatic type control units. The final chapters of the book undertake the specific application of the various control systems.

THE CORROSION OF METALS AND MATERIALS BY THE PRODUCTS OF COMBUSTION OF GASEOUS FUELS (Report No. 4)—This is the final report on studies conducted at Battelle Memorial Institute under the AGA domestic gas research project DGR-4-CH, "Research in Corrosion, Oxidation and Deterioration of Metals Under the Influence of Products of Combustion of Gaseous Fuels."

This last portion of the investigation indicates maximum temperature limitations of aluminized steel to be about 1200° F and stainless steel about 1400° F. Tests on damaged panels of aluminized steel indicated that the coating afforded protection to uncoated or stripped areas as wide as the ½-in. maximum damage attempted.

Various types of welding employed indicated no deleterious effects on the corrosion behavior of the steels tested. Sulfur levels such as would be expected from normal odorant practice indicated little or no corrosion for aluminized steel, while conventional steel did not appear to be affected at levels below 0.4 grains per 100 cu ft.

Various types of operating conditions were checked. Ceramic coatings were tested, stressed samples analyzed, and effects of heat treatment of stainless steel were investigated.

Copies of the report are available from AGA headquarters, 420 Lexington Ave., New York 17, for $1 each.

THE PREFABRICATED PROTECTIVE COATING

FAST, SAFE, ECONOMICAL

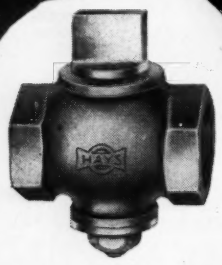
ARE YOU GETTING ALL THESE ADVANTAGES NOW

- Coating material of plasticized coal tar enamel or filled asphalt enamel.
- Reinforcement of woven glass textile fabric.
- Strip separator sheet to prevent sticking in rolls regardless of temperatures.
- Excellent bond to adjacent coating and pipe.
- Conveniently applied to full 3/32 inch thickness.
- No waste of bituminous material.

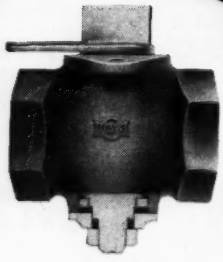
WRITE TODAY FOR A FREE DESCRIPTIVE FOLDER.

PROTECTO WRAP CO.
ENGLEWOOD, COLORADO

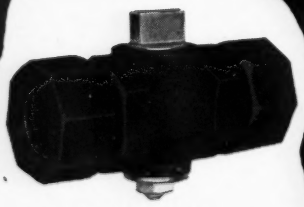
IT PAYS TO BUY HAYS that are TOPS



7405
Iron Body, Galvanized,
Bronze Plug Stop



7490
"Key-Lok" Tamper Proof Stop
Lockwing—Iron Body,
Bronze Plug



7500
Threadless Gas Stop
Iron Body, Brass Plug

Service Line Stops—Meter Stops
Appliance Stops

Tamper Proof and Standard Patterns

Iron Body with Brass Plug
Black or Galvanized
Also All Brass Stops

Flat Head—Flat Head with Lockwing

Full Range of Sizes

Quality Assured . . .
By Precision Machining—
Individual Testing—
Rigid Inspection

Quality Proven . . .
By Supplying the Gas Industry
for Over 80 Years

Standard Packaging for Easy Handling,
Space Saving Storage . . . Another HAYS First

Write for literature, or ask "The Man from Hays"

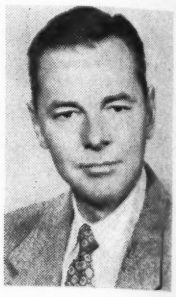
HAYS
GAS SERVICE PRODUCTS
HAYS MANUFACTURING CO.
ERIE, PA.

People

Promotions

GUY WADSWORTH JR. has been appointed general manager of Southern Counties Gas Co., Los Angeles, succeeding ARTHUR F. BRIDGE, formerly president and general manager, who will continue to serve as president. Mr. Wadsworth has been vice president and assistant general manager since 1947. He joined the company in 1921. For a period, however, he served as assistant financial advisor to the Republic of Haiti. Returning to SoCounties, he bacame personnel manager. In 1937 he held the same post for Southern California Gas Co., and was elected vice president and a director of SoCal in 1941.

Guy Wadsworth
So. Counties



C. H. Schutter
Empire Stove

CECIL H. SCHUTTER has been appointed branch manager for the Kansas City, Mo. territory by Empire Stove Co., Belleville, Ill. His territory will comprise parts of Missouri, Kansas, Nebraska, and Iowa.

WILLIS G. SCHOLL, vice president in charge of the tractor division for Allis-Chalmers Manufacturing Co., Milwaukee, has been elected to the firm's board of directors.

PAUL C. MCCONNAUGHEY has been promoted to the post of sales manager of the Gas & Coke Div. of Koppers Co. Inc., Pittsburgh.

CHARLES G. HESS JR. has been named corporate secretary of the Lone Star Gas Co., Dallas, succeeding T. J. UHL, who retired recently after 34 years with the company. MARY EMISON has been appointed assistant secretary of the company.

C. H. RIPPE has rejoined Hamilton Manufacturing Co., Two Rivers, Wis., as a member of the sales staff of the home appliance division.

THOMAS H. RENNELL JR., most recently executive assistant for gas at Salem, Mass., has been named general superintendent of the Berkshire Gas Co. with headquarters at North Adams, Mass.

Affiliated Gas Equipment Inc., Cleveland, has promoted JAMES A. HUGHES, vice presi-

H. L. Clary

J. A. Hughes

Affiliated Gas Equipment

dent of AGE and general manager of the Bryant Heater Div., to the post of assistant general manager of AGE in addition to his present duties. HOWARD L. CLARY is the new assistant general manager of the Bryant division.

THOMAS E. GRAVENSTRETER has been named manager of air dryer sales of the Bryant Heater Div., Affiliated Gas Equipment Inc., Cleveland.

JOSEPH A. GRAZIER has been elected president of American Radiator & Standard Sanitary Corp., Pittsburgh, succeeding THEODORE E. MUELLER, who was elected chairman of the board of directors.

A. D. VINING is the new executive vice president and general manager of White Products Corp., Middleville, Mich.

HUGH C. DALY has been elected a vice president of Michigan Consolidated Gas Co., Detroit. He will retain his duties as assistant secretary, the post he has held since joining the company in 1950.

R. S. HUFFMAN has retired as safety director of Oklahoma Natural Gas Co., Tulsa. He has been succeeded by W. VANCE SMITH.

GLEN E. FOSTER, vice president of Brooklyn (N. Y.) Union Gas Co., has been elected a director and made a member of the company's executive committee.

Top level management changes in the appliance sales division of Servel Inc. have resulted in the appointments of NEAL E. SCHUMAN as field sales manager and FRANK A. MITCHELL as general product manager, both newly created positions.

GEORGE A. STAMMERS, formerly division superintendent at Brantford, has been appointed general superintendent of the Dominion Natural Gas Co. Ltd., Buffalo, N. Y.

Arkansas-Western Gas Co. has also announced that JOE GANNER has become district manager of the company's Clarksville (Ark.) district properties.

Recently elected officers of State Fuel Supply Co., Oklahoma City, include EARL J. NEWLIN, president. Other officers are L. A. SEYFFERT, chairman of the board; L. E. FERGUSON, 1st vice president and superintendent of company operations; ARLIS R. TAYLOR, assistant treasurer.

JOHN H. ADAMS has been named assistant chief engineer of the Dollinger Corp., Rochester, N. Y.

New faces

H. F. JACOBSMEYER has joined the Grayson Controls Div., Robertshaw-Fulton Controls Co., Lynwood, Calif., as sales promotion engineer. He was formerly with the Southern California Gas Co.

J. H. Adams

Dollinger

T. G. Thurston

Selas

THURMAN G. THURSTON has joined the Selas Corp., Philadelphia, as its representative in the Cleveland, Ohio territory.

No Longer is it Necessary to Invest in Dual Fuel to Utilize Gas.

just *Add* gas!

with **WEBSTER'S**

REVOLUTIONARY

PACKAGED RECTILINEAR* GAS BURNER

The Packaged Rectilinear makes four inches pressure do the work of four pounds with fractional horsepower. You can fire gas — automatically — through any narrow opening without disturbing your present firing equipment — hand or stoker fired coal, oil or whatever it may be.

WRITE FOR..LITERATURE

*Trademark

The WEBSTER ENGINEERING COMPANY

TULSA, OKLAHOMA

Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

WILLIAM N. DONACHY and ANDREW SESOCK have joined the sales engineering department of American Meter Co. Mr. Donachy's territory includes southern Kansas, western Arkansas, and Oklahoma; Mr. Sesock will headquarter in the Billings, Mont. district.

New director of personnel for Colorado Interstate Gas Co., Colorado Springs, is JOHN T. BAKER, a special agent for the FBI for the past seven years.

HOLLIS L. FARROW has joined the Eureka Williams Corp., Bloomington, Ill., as field service engineer for the Williams Div. in Maine, Massachusetts, Connecticut, New Hampshire, and Rhode Island. Joining the same division as field sales representative in northern Illinois and Indiana is HAROLD HANSEN.

H. L. Farrow
Eureka Williams

Harold Hansen
Eureka Williams

IVAN P. KINDER has joined Carlon Products Corp., Cleveland, as field engineer. Carlon also has appointed CLIFFORD L. LEMON and JAMES D. CLEMINSHAW as sales representatives in the southwestern territory.

HARRY BAIRD has joined Temco Inc., Nashville, as traffic manager, succeeding BILL CORDELL.

Honors

CAPT. ELMORE S. PETTYJOHN, vice president and director of the Institute of Gas Technology, received a "distinguished alumnus" award from the University of Michigan's college of engineering recently for "his contributions to the development of the field of engineering."

WILLARD F. ROCKWELL JR., president of Rockwell Manufacturing Co., was recently elected to the board of directors of Allegheny Airlines.

OAKAH L. JONES, Tulsa district manager of the Oklahoma Natural Gas Co., will serve as president of the Tulsa Chamber of Commerce for the year 1954.

Deaths

D. P. HARTSON, 64, retired vice president and general manager of Equitable Gas Co., Pittsburgh, died Nov. 9. He retired from Equitable in January 1952 after 32 years service. However, he continued to serve as a director and consulting engineer. He also served as vice president of the Pittsburgh & West Virginia Gas Co. before Equitable was separated from the parent firm. He joined Equitable in 1920; in 1931 became operating manager, a post he held until 1942 when he was elected vice president and general manager.

D. P. Hartson
Equitable Gas

C. U. Williams
Eureka Williams

CHARLES U. WILLIAMS, founder of the Williams Oil-O-Matic Heating Corp. and a pioneer in the oil heating industry died Oct. 30 in Bloomington, Ill. He was 86. Mr. Williams was the first president of Williams Oil-O-Matic, which became the Eureka Williams Corp. in 1945. He served as president until 1939.

HARRY J. CRAWFORD, who served as a director of Lone Star Gas Co., Dallas, died Nov. 3. He was 86 years old.

PEERLESS
Type "MP"
ODORIZER
UNIT
The Peerless Type "MP" Odorization Unit has been designed to provide a complete odorization setup which is easily installed. This odorizer utilizes the Patented Peerless principle of liquid odorant injection.
LOOK AT THESE ADVANTAGES . . .
• Accurate proportioning of odorant into line.
• Safety tank built in. Cannot flood.
• Leakage is eliminated since all welded piping and packless valves are used.
• It occupies a minimum of space. Only one foundation needed.
• A minimum of piping is required for installation.
• Installation time is reduced.
• Maintaining odorizer is quite simple. Odorizer mechanism easily accessible.
Write for Bulletin 904 & 905
Peerless Type "MP" Odorizers have many more outstanding advantages, all engineered to give you the most accurate odorizer available.
PEERLESS MFG. CO.
PEERLESS MANUFACTURING CO.
P. O. BOX 7193 ★ DALLAS, TEXAS ★ DIxon-8431
REPRESENTATIVES IN ALL PRINCIPAL CITIES

ASSOCIATIONS

Natural gas substitute may be available in 1954

An acceptable substitute for natural gas may be available late in 1954 or early 1955, according to Capt. E. S. Pettyjohn, vice president and director of the Institute of Gas Technology, Chicago.

Captain Pettyjohn reported on the progress in the search for a natural gas substitute and other research projects in his report to the 12th annual meeting of the members and trustees of the Gas Institute in St. Louis on Oct. 27.

He said the last year marked "the first time a conversion to gas has been accomplished without a solid or liquid residue resulting in the operation."

"This is performed," he explained, "by a new process of pressure hydrogasification which allowed the gas institute to produce a completely interchangeable natural gas substitute from natural gasoline with complete conversion of the gasoline to gas."

In outlining the program for the coming year he included a fundamental study of the combustion characteristics and radiant heat transfer in open flames and a study of the storage of hydrocarbons for peak loads.

Dr. John T. Rettaliata, president of the Gas Institute and Illinois Institute of Technology, spoke briefly and introduced Captain Pettyjohn. F. H. Lerch Jr., chairman of the Gas Institute's board of trustees and director of the Consolidated Natural Gas Co., New York, gave the welcoming address.

During the business session, Carl Sharp, chairman of the board of Acme Steel Co., Chicago; R. M. Heskett, president of Montana-Dakota Utilities Co., Minneapolis; and John E. Heyke Jr., president of Brooklyn Union Gas Co., were named to the board of trustees.

Mr. Sharp replaces Wilfred Sykes, director of Inland Steel Co., Chicago; Mr. Heskett takes the place of John L. Halloway, president of Crane Co., Chicago; and Mr. Heyke succeeds the late Hugh H. Cuthrell, who was chairman of the board of Brooklyn Union.

NACE sponsors short course on cathodic protection

A week-long program of study and conferences was sponsored last month by the western region of the NACE in Los Angeles, including a three-day course on cathodic protection at the University of California in Los Angeles and a conference covering corrosion problems affecting pipelines, oil refineries, and aircraft.

Among the conference speakers were F. A. Hough, Southern Counties Gas Co., discussing "American Standards Assn. Efforts to Establish a Code for Gas Pipelines That Will Meet Approval of All States," and

THE NORMAC
BELL JOINT CLAMP

A SIMPLE SOLUTION for one of the GAS INDUSTRY'S *most trying problems*

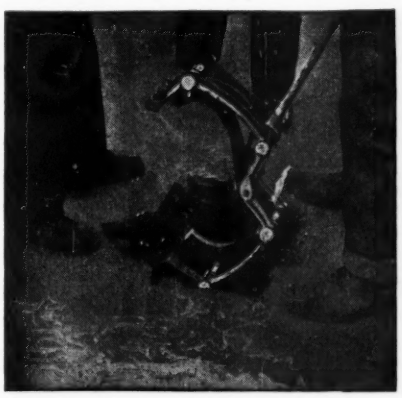
Solves Your Joint Repair Problems • Quick • Easy • Permanent

Installed in small pavement openings. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp . . . often in only a quarter of an hour. SAVES TIME. SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Such small opening repairs are scarcely noticeable when pavement is replaced.

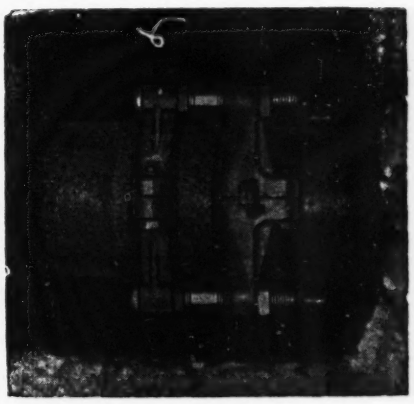
Normac Clamps can be installed in large as well as small openings.

Norton-McMurray hold definite leadership in the development of methods for installation and rehabilitation work through small openings. We welcome the opportunity to help solve a problem you may have—tell us about it.

Write for our catalog describing our complete line of
COUPLINGS . . . FITTINGS . . . SERVICE TEES and ELLS . . . SLEEVES . . . COMPRESSION-END COCKS . . . METER BARS and BRASS FITTINGS for copper pipe.



6 inch Normac Clamp being lowered into hole for installation



6 inch Normac Clamp in service after installation

NORTON-McMURRAY MFG. CO.
122 SOUTH MICHIGAN AVENUE • CHICAGO 3, ILLINOIS
Method and product covered by U. S. Patents, Nos. 2,163,261 and 2,178,286.

Prof. Earl R. Parker, University of California, discussing "Metallurgy of Pipe and the Mettalurgical Approach to Corrosion Problems in Large Diameter Pipe."

Consumer folder issued by AGA Laboratories

A new consumer folder has been issued by the AGA Laboratories to aid the gas industry in its sales and promotional efforts. The two-color folder concisely outlines what the Laboratories approval seal means, and tells the story of testing and inspection activities.

Designed for distribution by gas companies, appliance manufacturers and dealers, the folders can be mailed with company bills, distributed to home service and other groups at demonstrations and exhibits, and as counter pieces.

The folder may be obtained from the AGA Lab, 1032 E. 62nd St., Cleveland 3, at the following prices: 100 to 999, $2 per 100; 1000 to 9999, $1.50 per 100; 10,000 and over, $1.20 per 100.

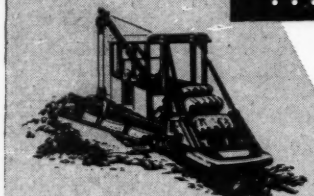
O. D. Donnell receives API's gold medal

One of the highlights of the 33rd annual meeting of the American Petroleum Institute, held in Chicago last month, was the

It takes a FULL team

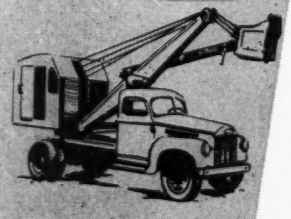
...whether it's mushing

...or digging equipment



1. This is for big jobs

2. This is for medium jobs



3. Sherman for all other jobs

On many excavating jobs the use of big equipment is costly and time-consuming. The Sherman Power Digger is designed so that you get all the advantages of power digging on these jobs. Thousands of users have proved that the Sherman Power Digger reduces costs. Write today for descriptive literature J9.

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Patent No. 2,303,825
Other patents pending

Sherman
PRODUCTS, INC.
ROYAL OAK, MICHIGAN
Sherman SP Products

CALENDAR

December

1-4..University of Oklahoma Corrosion Conference — University of Oklahoma, Norman.

9..NEGA Safety Conference — Hotel Statler, Boston.

10..NEGA Appliance Servicing Conference — Hotel Statler, Boston.

11..NEGA Heating & Air Conditioning Group, Industrial Division—Hampshire House, Boston.

1954

January

14..SGA Air Conditioning Service Installation, East — Tutwiler Hotel, Birmingham, Ala.

14..NEGA Operating Division — Hotel Statler, Boston.

14-21..National Housewares & Home Appliance Exhibits — Navy Pier, Chicago.

15..SGA Air Conditioning Sales, East Conference — Tutwiler Hotel, Birmingham, Ala.

17-21..National Assn. of Home Builders 10th Annual Convention & Exposition—Chicago.

21..SGA Air Conditioning Service & Installation, West — Rice Hotel, Houston.

22..SGA Air Conditioning Sales, West Conference — Rice Hotel, Houston.

25-27..ASHVE 60th Annual Meeting — Rice Hotel, Houston.

February

5..SGA Employee Relations Conference — Hilton Hotel, El Paso.

5..SGA Accident Prevention Conference — Hilton Hotel, El Paso.

8-12..Western Winter Radio-Television & Appliance Market — Western Merchandise Mart, San Francisco.

16..NEGA Accounting Division — Hotel Statler, Boston.

March

1-5..American Society for Testing Materials Spring Meeting — Shoreham Hotel, Washington, D. C.

4-5..AGA Transmission and Storage Conference — Jung Hotel, New Orleans.

15-17..Mid-West Gas Assn. Annual Meeting — Fort Des Moines Hotel, Des Moines, Iowa.

25-26..Oklahoma Utilities Assn. Annual Meeting — Biltmore Hotel, Oklahoma City.

25-26..New England Gas Assn. Annual Meeting — Hotel Statler, Boston.

April

12-14..AGA Sales Conference on Industrial & Commercial Gas — Edgewater Beach Hotel, Chicago.

12-14..National Conference of Electric & Gas Utility Accountants—Hotel Statler, Boston.

13-15..Southwestern Gas Measurement Short Course — University of Oklahoma, Norman.

20-23..AGA Distribution, Motor Vehicles, and Corrosion Conference—Mount Royal Hotel, Montreal, Canada.

22-23..Indiana Gas Assn. Annual Meeting — French Lick Springs Hotel, French Lick, Ind.

26-28..Mid-West Regional Gas Sales Conference — Edgewater Beach Hotel, Chicago.

26-28..AGA National Conference of Purchasing & Stores — Henry Grady Hotel, Atlanta, Ga.

26-28..Southern Gas Assn. Annual Convention—Houston.

May

10..AGA Commercial Gas School — Chicago.

9-12..LPGA Convention — Conrad Hilton Hotel, Chicago.

13-14..Public Utilities Advertising Assn. — Hotel Statler, Boston.

19-21..GAMA Annual Meeting — The Drake Hotel, Chicago.

24-26..AGA Production and Chemical Conference — William Penn Hotel, Pittsburgh.

27-28..Natural Gas & Petroleum Assn. of Canada — Prince Edward Hotel, Windsor, Ontario, Canada.

June

28-29..Michigan Gas Assn.—Grand Hotel, Mackinac Island, Mich.

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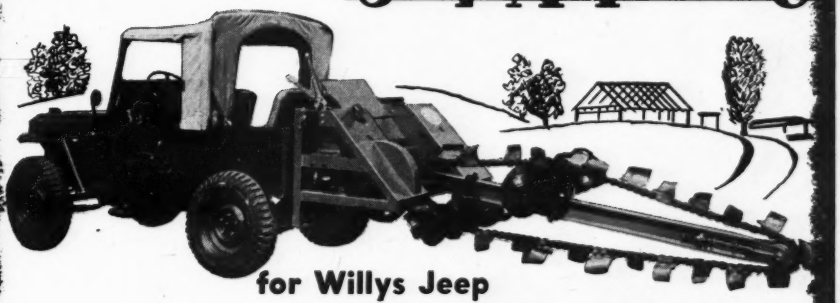

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- ***ONE-MAN OPERATION!***
- ***ECONOMICAL MAINTENANCE!***
- ***EASILY ALTERED TRENCH WIDTHS UP TO 14 INCHES!***
- ***ANY DEPTH UP TO 6 FEET!***

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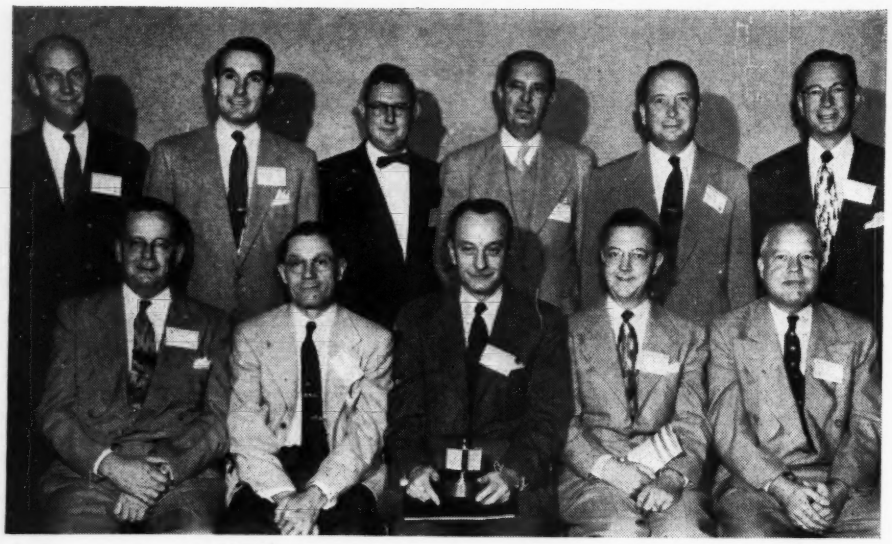


Winners of the trophy weather clocks in Servel's refrigerator campaign were honored at the AGA convention. They are (front row from left): J. E. Walsh, Omaha; E. C. Fleischli, Springfield, Ill.; James F. Donnelly, Evansville, Ind.; A. E. Hatley, Muncie, Ind.; J. C. Sackman, Hammond, Ind. Back row: J. H. Chenery, Birmingham; A. D. Schrodt, Dallas; R. H. Lowe, Pittsburgh; H. A. Kievenaar, Boston; L. P. Thomas, Houston; F. M. Foster, Los Angeles. For more information on the convention see page 45.

presentation of the Gold Medal for Distinguished Achievement to Otto D. Donnell, retired president of the Ohio Oil Co., Findlay, Ohio, and one of the founders of the API.

The award was inaugurated in 1946 to pay special tribute to Americans who have made outstanding contributions to the public welfare through the petroleum industry. Mr. Donnell, now 70, began his career as a mechanical engineer with Ohio Oil in 1906. He succeeded his father as president in 1927 and in turn was succeeded by his son in 1948.

NEWS

Operating men hear talks on industry and company

Executives, division and district managers, and supervisors of Kansas-Nebraska Natural Gas Co. met at the company's Hastings, Neb. headquarters recently to hear talks on virtually every phase of their company's and their industry's operations.

The program consisted of talks on gas reserves, well drilling, compressor stations, field and well operations, pipeline construction and maintenance, cathodic protection, safety, gas measurement.

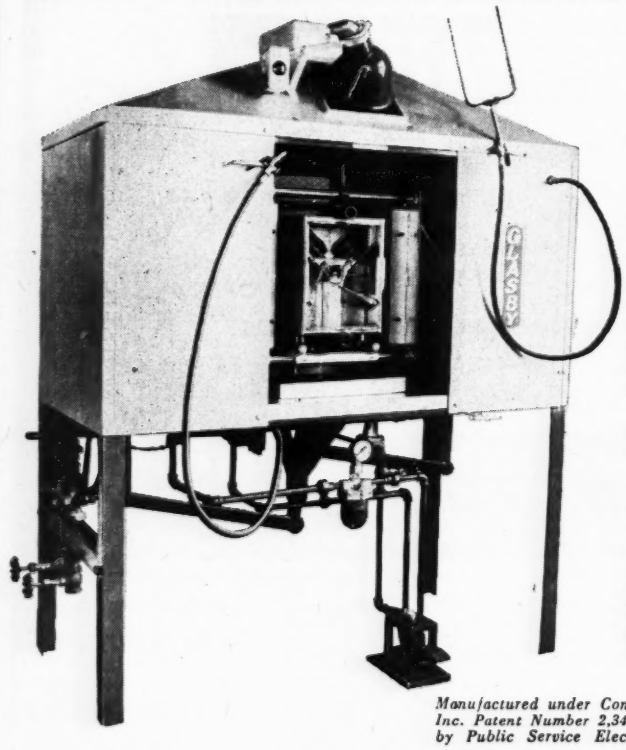
Distribution operations, maintenance, leakage problems, and distribution system construction were discussed by the general superintendent of distribution.

Other subjects included "Serving the Public"; "New Town Development, Importance of Trained Personnel, Importance of a Company Training Program"; utility merchandising, utility accounting, customer relations, budgets, financing, and government regulation.

Ohio heat installations to reach 82,000 in 1953

As the result of another order issued by the Ohio Public Utilities Commission, some 82,000 new and converted heating installations will be added in the state by the end

Fast Production on Precision Meter Repairs



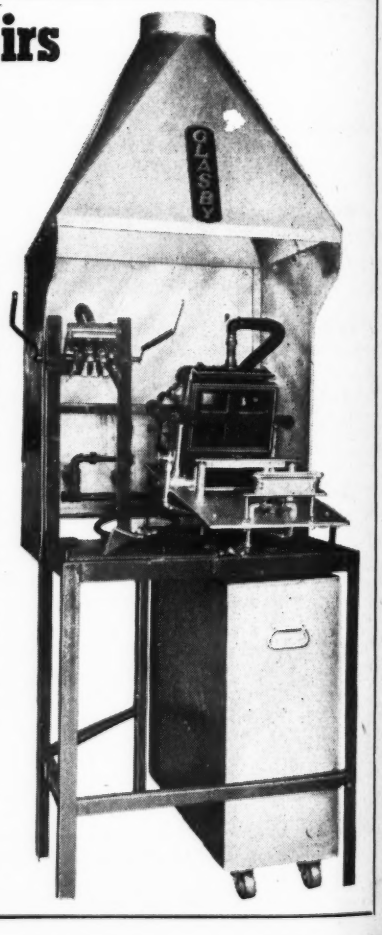
Minimum Repair Time Means Maximum Dollar Savings

← Meter Front and Back Removing Machine

This machine removes the front and back from gas meters in a fraction of the time previously required thus facilitating repair of diaphragms. Two models available — 5 light meter and 10 light meter capacity. Both models are adjustable to most makes of meters and feature additional safety devices to protect the operator.

Meter Top and Valve Box Cover Removing Machine →

This machine facilitates the removal of meter tops and valve box covers to minimize the time-consuming problems of meter repair operation. Available in 5 light meter and 10 light meter sizes, both adjustable to most makes of meters. Both models feature devices for the safety of the operator.



Manufactured under Consolidated Edison Company of New York, Inc. Patent Number 2,342,045. Application development assistance by Public Service Electric and Gas Company of New Jersey.

THE J. P. GLASBY MFG. CO. INC.

BELLEVILLE 9, NEW JERSEY — *Manufacturers of Glasby Conversion Burners and Furnaces*

of 1953. Approximately 50,000 of these would be in East Ohio Gas Co.'s territory and the rest spread throughout the state.

On Oct. 23 the commission ordered Ohio Fuel Gas Co., Columbus, and its wholesale customers to add 10,722 space heating customers by the end of the year. This number is in addition to the 10,000 customers ordered to be served on Sept. 18.

In addition, the PUCO required Ohio Fuel to keep on adding as many space heating customers in Ohio as does the Columbia Gas System in all its seven other operating territories, meanwhile tightening the provisions of this order originally laid down last spring.

In its latest order, the commission said requests for a complete freeze by Columbia, "in light of all the evidence, are unreasonable." The commission also criticized the FPC for sending gas to eastern states and found that evidence presented "conflicted with" requests for a complete ban on all gas home furnaces.

The new order also stipulates that all Ohio gas companies report on their estimated supplies for the 1954-55 winter on April 1, 1954 instead of the original date of April 15.

The breakdown of the 10,722 installations authorized is as follows: Ohio Fuel, 47% in its own operating territory; Cincinnati Gas & Electric, 20.8%; Dayton Power & Light, 18.4%; West Ohio Gas, 2.85%; and Portsmouth Gas, 1.65%. Manufacturers Light & Heat Co. and the Natural Gas Co. of West Virginia will divide 6.75%, and 23 other smaller companies and communities will split the remainder.

On Oct. 7, the PUCO instructed East Ohio Gas Co. to clean up all its backlog of orders, numbering about 3500, and henceforth to install three conversions for each new unit. The rule in Ohio Fuel's territory is one conversion for each new installation At the same time, the PUCO lifted all restrictions for the Bryan (Ohio) division of the Ohio Gas Co., which gets its supplies directly from a transcontinental pipeline.

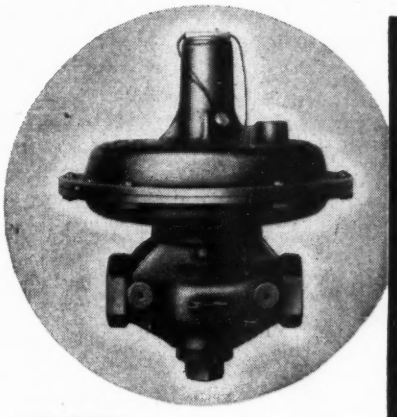
In detailing factors leading to the authorization of the 10,722 additional installations, the commission quoted a Columbia witness as saying the "industrial load . . . could be cut in case of an emergency and propane, or artificial gas could be brought into use," leaving more than 45.6 MMcf of gas to be used for additional home units, or 10,372 new Ohio customers, basing the allocation on the state's historical use of one half of Columbia's total sales.

The PUCO also stated that it found Columbia had not reported until the hearing on the number of new customers added in its other territories, as required by last spring's order. When these reports were taken into consideration, the commission found that Ohio could safely add another 10,350 customers. The PUCO deducted from this figure the 10,000 new units authorized in its Sept. 18 bench order.

Adding the remaining 350 to the 10,372

Steady

REYNOLDS LOW PRESSURE REGULATORS



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allowable because of possible industrial curtailment and the use of propane, the commission came up with 10,722 new space heating customers for Ohio.

ConEd to convert remaining areas to natural gas

Consolidated Edison Co. of New York has received PSC authorization to convert to straight natural gas the remaining part of its territory, the Astoria and Long Island City area of Queens, now supplied with mixed gas.

The company estimated the cost of converting equipment of its 82,325 customers in the area at $1,729,000 and the cost of modifying its distribution system there at $587,000.

Tie-ins available for Mrs. America contest

The Mrs. America contest committee has announced that a limited number of openings remain for selected companies of noncompetitive products to tie in with the Mrs. America promotion. However, the products must be able to fit in logically with the overall Mrs. America homemaking program.

The Incineration Div. of Bowser Inc., Cairo, Ill., has been awarded exclusive rights in its field. Bowser will have exclusive use of the Mrs. America name, picture and endorsement for advertising, sales promotion, and publicity for its gas incinerator. The Incinor will be included in the year-round exhibit of the Mrs. America home at Ellinor Village, Ormand Beach, Fla. As part of the $15,000 in prizes, the winner will receive an Incinor for her own home. The Detroit-Michigan Stove Co. "Jewell" de luxe has been selected as the official gas range.

Tie-in companies will also be able to tie in locally with the selection of the state finalists. The name, pictures, and endorsements of state winners will be made available for local promotions or advertising, thus making it possible for participating manufacturers to concentrate in certain specific areas.

AGA is participating in the activity.

California companies' merger gets under way

A move toward the eventual merger of Pacific Public Service Co. and its subsidiary, Coast Counties Gas & Electric Co., with Pacific Gas & Electric Co., San Francisco, was made recently when PG&E applied to the California Public Utilities Commission for authority to issue shares of its common stock in exchange for all outstanding common shares of Pacific Public Service.

The holding company, Pacific Public Service, controls Coast Counties, which supplies natural gas, electric, and water service in areas of northern California.

Memphis sells TVA 6 billion cu ft of gas per year

Following approval by the city commission of amended gas rates, the Memphis Light, Gas & Water Div. has begun selling gas to the Tennessee Valley Authority for its generating plant. TVA had bought its gas direct from Texas Transmission Co.

According to the amendment, only TVA can qualify for the special rate, which makes service available to "a public utility power plant, operated in conjunction with the general electric distribution system of the Memphis Light, Gas & Water Div. . . ."

With the action, LG&W acquires its largest customer in TVA, which will use 6 billion cu ft gas annually.

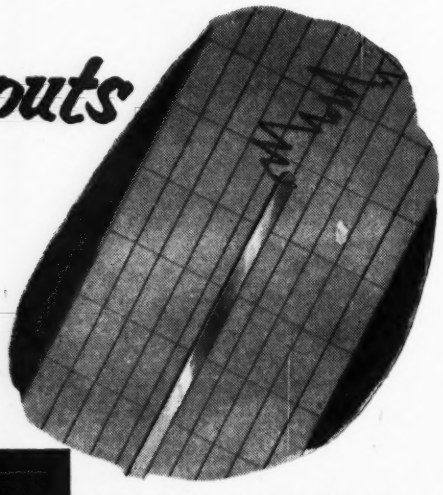
Gas utility sales up 1.1% in September

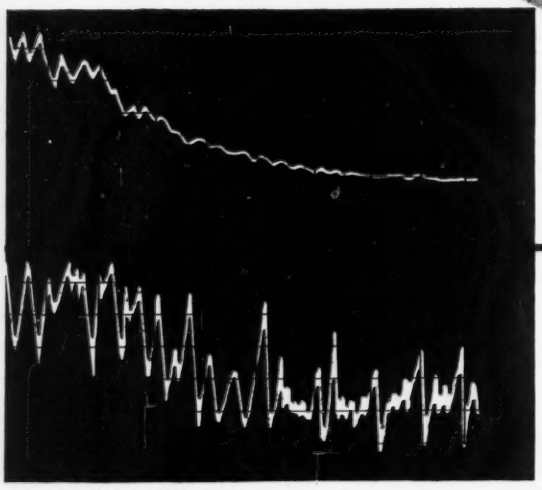
Gas utilities sold 3579 million therms to ultimate customers during September, a gain of 1.1% over sales of 3540 million in the same month a year ago. The AGA also reports that the September index was 153.8% of the 1947-1949 average.

For the 12 months ended Sept. 30, sales totaled 55,732 million therms, an increase of 9.8% over the previous cumulative period.

Natural gas utility sales in September

Lancaster puts the finger on friction





Cardiograph Reading On New Lancaster Metal Rim Diaphragm indicates no points of excess friction—uniform distribution of leather, perfect alignment of center pans, ideal weight and stiffness of leather, and proper amount of oil in leather.

Cardiograph Reading On New Diaphragm of Another Make (as received in proof) indicates excess friction. If installed in this condition, diaphragm would come in from 5% to 10% fast. (Diaphragm was later found to have non-uniform distribution of leather and center pans improperly aligned.)

Typical of Lancaster's leadership is the cardiograph designed by our engineers. It was extensively used in the development of Lancaster's new groove type metal rim diaphragm which has made such a hit with meter shop men.

Accurately checking differential of pressure under actual meter operating conditions, this cardiograph has put the finger on factors influencing diaphragm performance . . . and has helped determine the important new features found in the new Lancaster S-7 groove type diaphragm.

If you are not already using the new Lancaster groove type metal rim diaphragm for your small meter repairs and replacements, send for literature and prices today.

METER PARTS CO.

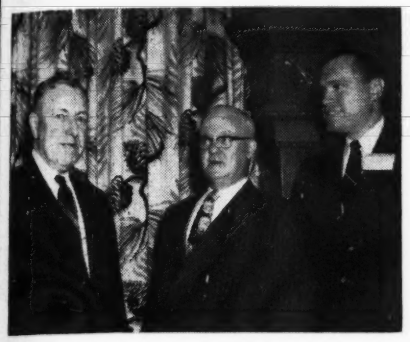
were up 1.3% over last year, reaching 3401 million therms. For the 12-month period ending in September, natural gas sales amounted to 52,484 million therms, a gain of 10.7% over the 47,420 million sold last year.

Aptitude tester devised for 18 occupations

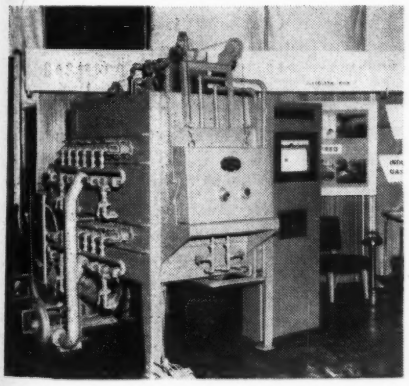
A new aptitude classification test has been announced by Science Research Associates Inc., Chicago, for personnel directors.

The new test battery, FACT (Flanagan Aptitude Classification Tests), consists of 14 critical job elements which have been found through on-the-job analyses to be the necessary skills of 18 different occupations: accountant, artist, businessman, chemist, office clerk, draftsman, electrician, engineer, machinist, mathematician, mechanic, airplane pilot, plumber, printer, salesperson, secretary, structural worker, and writer.

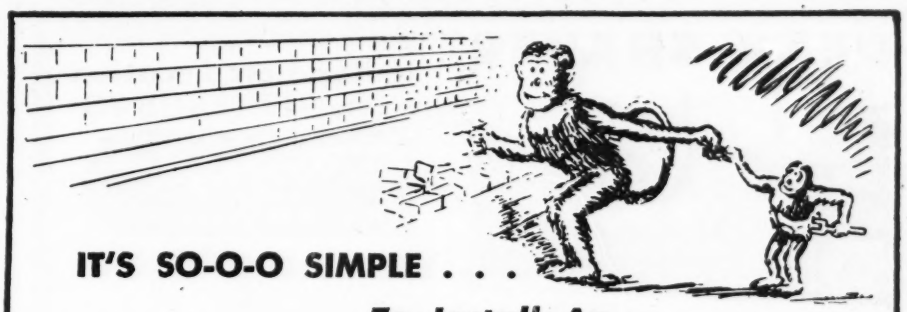
The FACT battery was developed by Dr. John C. Flanagan, professor of psychology



Earl L. Shaner (left), editor-in-chief of STEEL, was the principal speaker at the AGA's 17th annual Industrial Gas Breakfast held Oct. 21 in Cleveland. He was introduced by Carl H. Lekberg (center), past chairman of the section. Greetings from the ASM were given by George A. Roberts, Vanadium Alloys Steel Corp.



A new ceramic radiant tube furnace by the Gas Machinery Co., Cleveland, was one of the featured exhibits at the AGA combined industrial gas exhibit at the 1953 metal show held in Cleveland in October.



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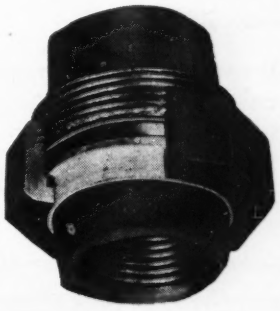

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W. F. Becker, Chief Inspector
The Ohio Fuel Gas Co. Columbus, Ohio

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at the University of Pittsburgh and director of the American Institute for Research, an organization devoted to scientific study of the use of human resources.

ConEd equips testers to detect atomic radiation

In case of an atomic attack, Consolidated Edison Co. of New York has trained 40 testers to detect atomic radiation and to estimate the amount a man can tolerate—and still stay on the job.

The company is organized to protect personnel, and at the same time, to do everything possible to maintain continuous service to customers and the community. Scattered at strategic locations around the ConEd system are complete testing kits, ready for use. They contain radiation survey equipment of various kinds, and uniforms, masks, and rubbers to be worn by testers. The uniforms are white so that personnel wearing them would be recognized immediately and allowed to enter any area for inspection.

Water heater shipments up for 16 successive months

For the past 16 months shipments of automatic gas water heaters have exceeded those of the corresponding month in the previous year, GAMA reports. September shipments, amounting to 177,500 units, increased the total for the first nine months of 1953 to 1,649,500, a 19.6% rise over the same period last year.

The nine-month figures for domestic ranges show an increase of 5.7% over the first nine months of 1952, with a total of 1,660,100 ranges shipped so far this year compared with 1,570,700 for 1952. Range shipments in September amounted to 201,400, 0.9% above the 199,600 for the same month last year.

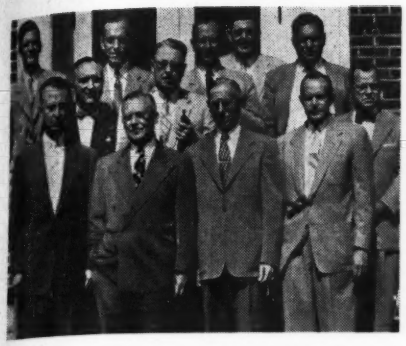
During the month of September, industry shipments of gas-fired central heating equipment totaled 101,200, bringing the nine-month total to 589,500 units, up 11.1% over the first nine months of 1952.

Gas and electric divisions to be separate operations

Under a new development program, Commonwealth Edison Co. proposes to separate the gas and electric operations of the Northern Illinois Public Service Co., Chicago.

The Public Service division, which supplies both electricity and gas in a large suburban and northern Illinois area outside Chicago, would continue its electric operations while the new gas company would be incorporated as the Northern Illinois Gas Co.

Application to the Illinois Commerce Commission will be made in the near fu-



Attending a recent meeting of the Bryant Heater distributor advisory board were (front row) P. R. Hedback, Indianapolis; Russell Harris, Omaha; J. N. O'Connor, Wichita; G. N. Gray, Tyler, Texas. Second row: J. M. Traugott, Philadelphia; O. L. Williams, Pittsburgh; R. C. Anderson, Houston. Top row: J. J. Rose, Atlanta; R. N. Campbell, Lyle C. Harvey, W. H. Wise, and James A. Hughes, all of Bryant and Affiliated Gas Equipment. The distributor board provides Bryant management with information vital to planning of aggressive merchandising and sales efforts, and gives an idea of consumer acceptance of present and proposed products.

ture. The move would be preparatory to about $60 million of new financing. Upon transfer of the properties, the new gas company would assume the sole obligation of mortgage bonds which will constitute a lien on gas properties. All of the stock of the new gas company would be owned by Commonwealth Edison Co. Management and personnel of the new company would be unchanged from that of the present gas operations.

Supreme Court won't hear common stockholders' plea

The Supreme Court has refused to hear a suit brought by a common stockholders' protective committee to prevent the Arkansas Natural Gas Corp., Shreveport, from paying claims of class A stockholders on a basis alleged to discriminate against holders of common stock. The Securities & Exchange Commission had approved the settlement as a part of a reorganization plan.

During reorganization proceedings, Class A stockholders put in a claim for $13 million, which Cities Service Co. made on some 2.5 million shares of Arkansas Gas class A stock sold in 1929. The SEC approved distribution of $3,265,000, amounting to $1.25 a share for Class A holders.

In a prior suit, the Federal Court of Appeals for the Third Circuit sustained the approval of the reorganization plan. However, common stockholders claim that Class A stockholders have no legal right to the extra $1.25 per share. In the brief filed by

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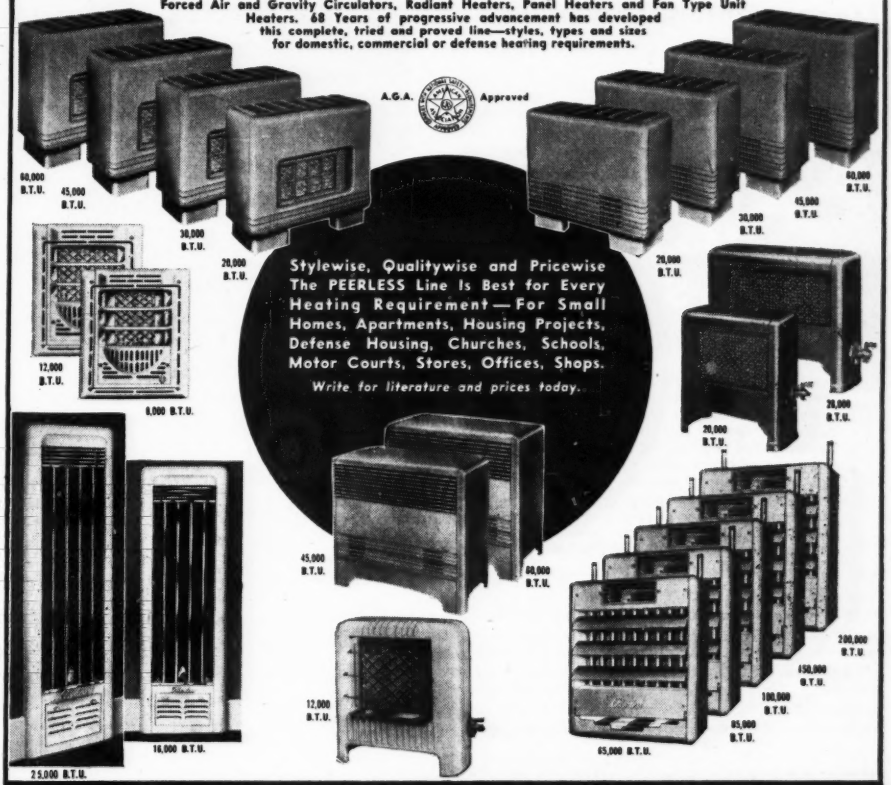
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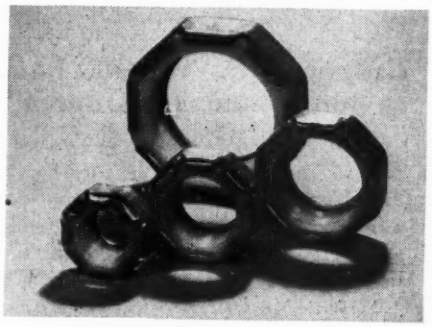

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the FPC, the settlement was defended as fair in that it did not in any way reduce the participation of the common stock in the assets of the corporation.

Manufacturers prevented from stopping gas service

A temporary injunction against the Manufacturers Light & Heat Co., Pittsburgh, has been upheld, preventing the company from shutting off gas to four customers operating furnaces without company permission.

The plaintiffs are among some 2000 users whose fuel, the company announced, would be shut off until permits for using the company's lines are issued. Clyde C. Armstrong, company attorney, argued that the issue was one for the PUC to settle and not the court.

However, the presiding judge declared that the "case might not be decided . . . before next summer, and a crisis might develop this winter."

According to Manufacturers, the "crisis" may come in January, when heavy usage by the non-permit furnace users may cause pilot lights to go out because of lack of fuel.

Coleman offers $1000 bond as performance guarantee

A $1000 "comfort" bond is being offered through the Traveler's Indemnity Co. by the Coleman Co., Wichita, to insure performance of its Blend-Air central heating system in support of its advertising and sales promises.

Performance guarantee includes maintenance of an average 70°F temperature inside residence with outside design temperature as set forth in the National Warm Air Heating & Air Conditioning Assn. guide, and the maintenance of 5° or less variation in temperature when outside temperature is as low as 30°F. At outside temperatures lower than 30°, the following inside variations are guaranteed: 6 at 20, 7 at 10, 8 at zero, 9 at —10, 11 at —20, and 12 at —30.

The unusual bond guarantee is being advertised currently with full-page color ads in leading consumer magazines. According to company report, the offer is already proving its power as a sales closer.

Oil heating men unite to combat natural gas inroads

A plan for a committee of oil heating men to formulate plans to combat natural gas competition was agreed upon at an oil industry meeting sponsored by the New York Oil Heating Assn. recently.

More than 350 persons, representing fuel oil dealers and oil burner installers in the metropolitan New York area and representatives from other oil associations, attended the meeting—the first of its kind—to find a way to solidify the various oil industry groups into an effective tool to meet the increasing threat of natural gas.

A representative of the Oil Heat Institute of America pointed out that progress is being made in other sections of the country with large oil associations. The need for increased funds for advertising was stressed.

Allis-Chalmers assumes operation of Buda Co.

On Nov. 1, the Allis-Chalmers Manufacturing Co., Milwaukee, officially assumed operation of the Buda Co., Harvey, Ill. In the future the company will be known as the "Buda Co., a division of Allis-Chalmers."

Operating as a division, Buda will continue to manufacture, distribute, and service all items in its regular line of products. Ralph K. Mangan, president of Buda since 1950, will be in charge of the division as president and general manager.

$50 million petrochemical plant now in operation

Dedication ceremonies were held last month for the new $50 million National Petro-Chemicals Corp. plant in Tuscola, Ill.,

Making its formal debut at the AGA convention in St. Louis was the New Freedom "Heart-Saver" gas kitchen, a completely modern kitchen and home laundry installation in a mobile house trailer. This is the first of 10 similarly designed trailers planned to acquaint housewives with the latest in step-saving design as well as to promote the use of gas appliances. Whirlpool home laundry appliances are featured in the trailer, which is displayed on a cooperative basis with Whirlpool Corp. and other appliance manufacturers.

GAS CLASSIFIED

Classified advertising is set in 6-point type, without border or display, at the rate of 15 cents per word per insertion; minimum charge per insertion $3. Box numbers for replies count as 5 words. Count as a word each one letter word and each group of figures. Classified advertising is only accepted when payment accompanies order. Copy and payment must reach publisher's office prior to 10th of month preceding publication.

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HEAVY DUTY PERFORMANCE
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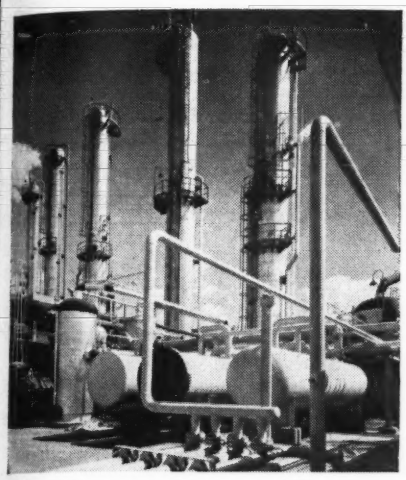
FISHER RESEARCH LAB., Inc.
PALO ALTO, CALIFORNIA

which will produce hydrocarbons and industrial chemicals from natural gas. (See *GAS*, August, page 41.)

The giant plant is owned 60% by National Distillers Products Corp., which manages and operates it, and 40% by Panhandle Eastern Pipe Line Co. The new plant will extract hydrocarbons from 400 MMcf of gas pumped in each day from Panhandle's compressor station adjacent to the plant. After the extraction process, the natural gas is returned to Panhandle lines and pumped through to consumers in Ohio and Michigan.

Of the hydrocarbons extracted, propane, butane, and natural gasoline are salable without further processing. The remaining hydrocarbon, ethane, is converted into ethylene, from which ethyl alcohol and ethyl chloride are manufactured.



Fractionation towers of the new petrochemicals plant form a new skyline over cornfield country near Tuscola, Ill.

News Notes

Outstanding scientific research by a member of the staff of Southwest Research Institute, San Antonio, Texas, will be recognized by an annual award established recently by Dr. Judson S. Swearingen. The winner of the award, $100 cash and a certificate, will be selected by an anonymous committee of two senior and ineligible members of the institute staff and one qualified scientist from outside.

Servel's 1954 line of appliances will be revealed for the first time this month at the company's annual national sales conference in Chicago, Dec. 14-16. Headquarters for the conference will be at the Conrad Hilton hotel. Presentation will be made from the stage of the Eighth Street theater and the exhibition hall in the lower level of the hotel will be used for a complete display of 1954 appliances.

The first of a series of letters and mailing pieces to 3500 home economists, high school

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and college home economics teachers, and home demonstration agents was sent out recently by Whirlpool Corp. in a supplemented educational campaign to enlist home economists in the use of Whirlpool home laundry appliances. Part of the campaign consists of source material from various manufacturers covering problems in home laundering. Attention was focused on the plan with the mailing of a wax apple candle to each home economist, tying in with the "apple-for-the-teacher" theme of the follow-up letter.

Kansas City Power & Light Co. has joined the long list of electric utilities conducting year-round tests of heat pumps in practical operation. This type differs from other types in that outside air rather than the ground is its source of heat for the reverse refrigeration process that warms the house in winter.

Completion of conversion of the service area of the Hartford (Conn.) Gas Co. from manufactured to mixed gas was scheduled for Dec. 4. At that time, the heating value of the gas was to be increased to its final 800 Btu per cu ft.

"Creative Cookery," a popular TV cooking show in Chicago, is now being telecast to New York, Cleveland, Washington, D. C., and surrounding areas. Using a Roper gas range, Francois Pope gives cooking demonstrations and offers famous recipes for a full hour.

Pacific Lighting Corp., San Francisco, has been authorized by its board to file a registration statement with the Securities & Exchange Commission covering a proposed issuance and sale of 800,000 additional shares of common stock. It is expected that the shares are to be sold directly to a nationwide group of underwriters headed by Blyth & Co. Inc., who will in turn reoffer the shares to the public.

The Gas Institute of Greater Miami (Florida) recently held its first Salesology seminar, which is designed to bring to both management and sales personnel new sales techniques. The first guest speaker, Harold Jalass, vice president of Cribben & Sexton Co., is shown here with a portion of the audience of 85 who attended the meeting. Additional meetings are scheduled over a period of five months.

The Public Service Electric & Gas Co., Newark, has received permission from the town council of Harrison, N. J., to construct 25 L. P. gas storage tanks in the community.

The first issue of *Idea Exchange*, a new publication sponsored and published by Servel Inc., featured successful appliance sales programs by utility companies. Among successful sales programs described and pictured in the first issue is the "Magic Key Campaign" used by Southern California and Southern Counties Gas Co. According to James F. Donnelly, Servel vice president, the new publication will provide an exchange for outstandingly successful advertising, promotion, and sales ideas.

Servel Inc. has appointed Leo Maxwell Co. Inc., Oklahoma City, as Oklahoma distributor for Servel home appliances. The company also announced that L. W. Wind Corp., Clayton, Mo., is now Servel air conditioning distributor for the St. Louis market area.

Royal Jet Inc. is the new name of Royal Heaters Inc., Alhambra, Calif. Reorganization plans of the company include additional sales territories to distribute the company's line of gas heating equipment.

Since Brooklyn Union Gas Co. changed over to natural gas more than a year ago, there has not been a single instance in which a faulty gas appliance has caused a fatality.

One of the first installations of "closed circuit TV" has been made at Pacific Gas & Electric Co.'s Moss Landing steam plant on Monterey Bay in California. The system enables the powerhouse operators to look inside the boiler furnaces from the control room in another part of the plant. Formerly, the operation of changing from fuel oil to natural gas took 25 minutes or more for each boiler. Now, with television, the operator in the control room can change all the burners at once in a period of five or six minutes.

Last month the national headquarters of the National Assn. of Home Builders opened six floors for permanent year-round exhibits in Washington, D. C. Among the exhibits will be the gas industry's unified exhibit of displays and New Freedom Gas Kitchens and laundries.

Reuter's Automatic Heating Co., Milwaukee, was the grand prize winner in the national window display contest among dealers of the Permaglas-Heating Div. of A. O. Smith Corp. One out of five of the Kankakee, Ill. division's thousands of dealers participated in the contest. Awards were based on eye appeal and the ingenuity shown by the dealer in supplementing the basic window dressing materials furnished by the company.

GAS

Transmission and Conditioning Section

Packaged technique for hydrostatic testing

(For story see page 95)

In the program now under way as a joint effort of the gas and steel industries to develop a national code for pressure piping, a major consideration is the setting up of standards for the testing of high pressure pipeline. Hydrostatic pipeline testing is a part of this picture as a standard procedure in certain areas.

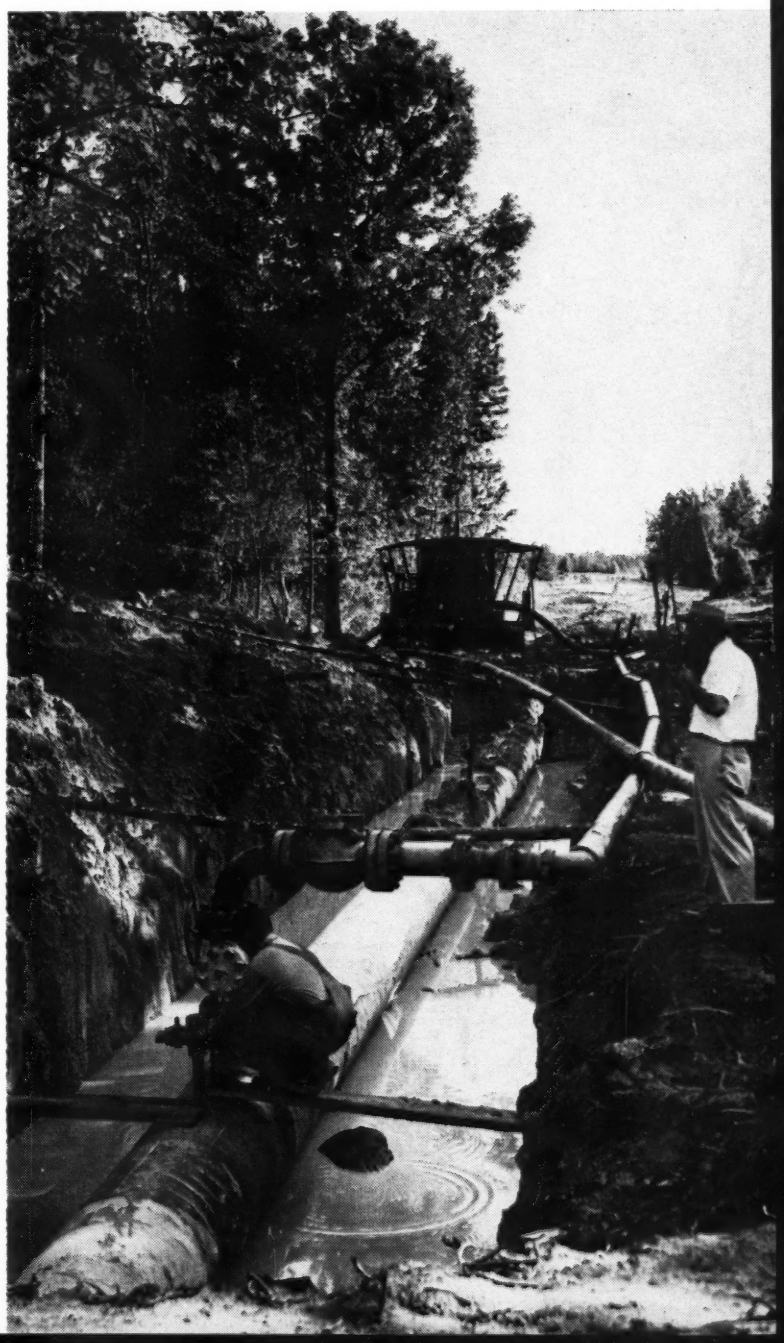
While the use of hydrostatic testing in those areas where there is a medium-to-heavy concentration of population is generally accepted as a worthwhile practice, the process poses certain inherent problems which have tended to restrict its use in borderline areas. The careful planning of a testing program is necessary to avoid excessive expense.

A successful hydrostatic test carried out without undue loss of time and at a reasonable cost requires the use of specialized equipment, techniques and personnel, and a systematic schedule of planning and supervision. The project must be engineered in the light of the available sources of water, and the profile and design of the line. Special high capacity pumps are generally required for filling the line, and equally specialized high pressure pumps are needed to make the actual pressure test.

The testing program should be integrated with the overall construction or rehabilitation program if the saving of time is an important element. Finally, the recording and reporting of test results should be made in an accurate and orderly manner.

In effect, therefore, a hydrostatic testing program requires a specialized engineering approach in much the same manner as certain other phases of the construction and operation of a gas pipeline require specialized treatment. Trained personnel making use of specialized techniques and equipment are a generally accepted prerequisite of a successful testing program.

A unique approach to the problems of hydrostatic testing which applies the philosophy of specialization is made in the article by Leon Brooks, beginning on page 95. Therein he describes what is referred as to as a "package" program for carrying out the test.



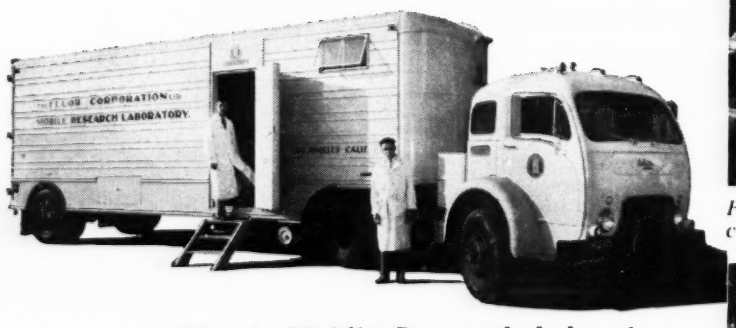
stop vibration before it starts

with a FLUOR pulsation dampening piping system

A Fluor Pulsation Dampening Piping System smooths out the "puffs" created by reciprocating action of compressors. It eliminates one of the chief causes of piping vibrations. A smooth, steady gas flow incurs less frictional resistance and reduces line breakage due to pipe fatigue. Without dampeners there is no alternate solution: *no matter how well pipe is anchored, the basic pulsations remain* – to cause problems with metering accuracy and plant safety.

For new construction, Fluor supplies the complete piping system, prefabricated, ready for installation. Pulsation dampening is designed right into the basic compressor system through an engineered selection of bottles, headers and laterals. *It is built in, not added on.* And it costs little more than a conventional system because it eliminates expensive pipe anchoring and allows the design of related equipment based on a system free of pulsative flow.

For existing construction, Fluor's two "package-type" Pulsation Dampeners, in both manifold and in-line types, are easily installed in existing plants with an excessive vibration problem. The Fundamental Dampener minimizes objectionable pulsations while providing the continuous advantages of low pressure drop and less stress on piping, heat exchangers and vessels. The High Frequency Dampeners are supplied where pulse frequencies are in the range of the second harmonic or higher.



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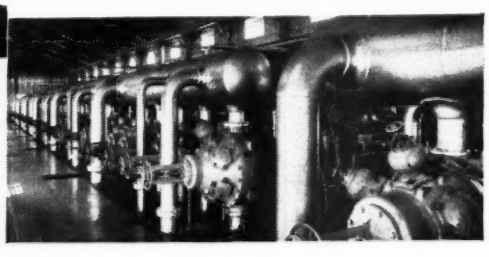
Fluor Pulsation Dampening Piping System built into new compressor station assures accurate metering.



Fluor Pulsation Dampeners curb vibration caused by reciprocating action of compressors.

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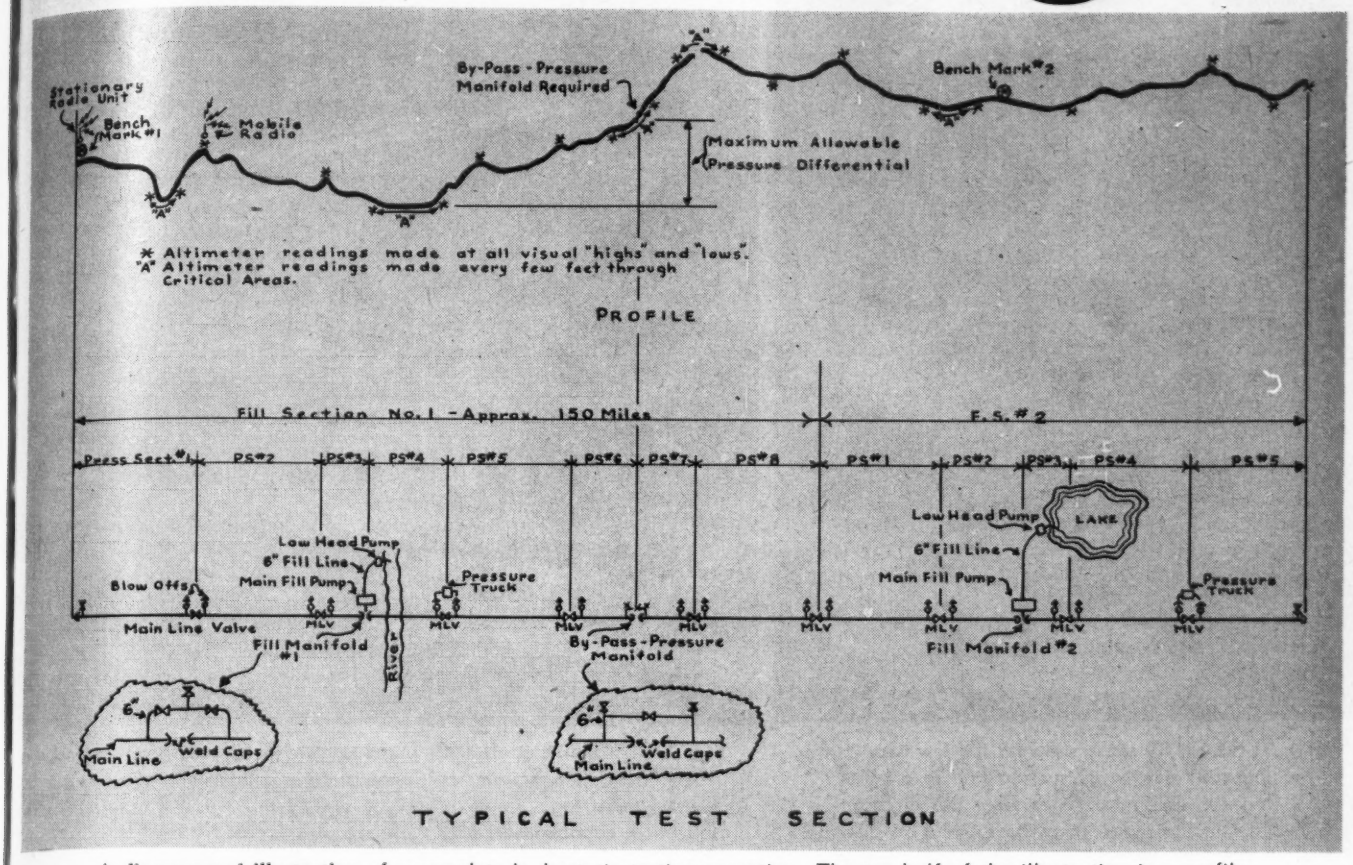

A diagrammed illustration of a complete hydrostatic testing operation. The top half of the illustration is a profile of an imaginary pipeline of over 200 miles in length. The method which is used to take aneroid barometric readings from bench mark references with the use of portable radio communication equipment is shown. The bottom half of the illustration is looking down on the same pipeline, and shows how the line is sectionalized into fill and pressure sections based on the profile, the location of water sources and line valves. In this imaginary operation, only one fill unit and one pressure unit is shown for each fill section. The profile of the line indicates the maximum allowable pressure differential and dictates the location of a mainline manifold.

"PACKAGED" TECHNIQUE

for hydrostatic testing of pipelines

(See Pipeline Cover)

By **LEON BROOKS** • Williams Pressure Service Co., Shreveport

WITH the advent of long distance, high pressure gas transmission systems and the resultant need for a standardized set of construction practices, the hydrostatic testing of gas pipelines has been widely examined as a standard procedure. Those who feel that hydrostatic pipeline testing offers a valid testing procedure have directed substantial efforts toward the development of a testing procedure that can be integrated with established pipeline construction and rehabilitation practices.

As a result, specialists in the field have built up a body of specialized techniques and equipment for carrying on a test. Efforts have been directed toward producing a better testing program that can be carried out at lower cost which, at the same time, is not burdened with many of the complications generally attributed to the process.

A unique approach to the practice of hydrostatic testing, as undertaken by specialists, is the package testing service that is offered by the Williams Pressure Service Co., of Shreveport, La. The Williams Co. has developed special equipment and techniques for hydrostatic testing, and is the first to offer the services of trained personnel in the field for the handling of a complete testing program on a contract basis.

The service involves engineering and preliminary investigation for the test, and profiling of the line if it is found advisable. It also provides for all equipment and personnel for the test along with the purchasing of all necessary testing materials. Maintenance of records and the preparation of a final report are also included in the package program.

Although methods and equipment been developed primarily for use with large diameter lines, the entire service or portions thereof are adaptable to smaller lines or special pipeline testing needs.

A hydrostatic testing program on new construction is contracted for and programmed to coordinate with the pipeline construction schedule in such a manner that the line will be ready for use as soon

Fig. 1. A typical fill setup showing the low head pump in the foreground with its suction line in a creek. A light weight 6-in. line extends from the discharge of low head pump to main fill pump located on pipeline.

Fig. 2. A trailer mounted fill pump shown in operation on a section of Texas Eastern's Kosciusko-to-Connellsville pipeline. The pump is a 6-in., 3-stage centrifugal pump driven by a 245-hp twin diesel engine. The unit has a capacity of 1300 gpm at a pressure of 500 psi.

as possible after completion. In this way the testing program becomes an integral part of the pipeline construction program. In the case of Texas Eastern Transmission Corp.'s 308-mile, 24-in. line from Provident City, Texas, to Castor, La. the line was tested and ready for service within 48 hours after final tie in.

Provisions are also made for progress reports during the course of the test, and for the final reporting at the conclusion of the project.

In some types of terrain it is advisable to profile the line to be tested because of the difference in hydrostatic head between high and low points. A method of profiling that is less expensive and more expedient than running levels was devised by the use of aneroid barometers.

By this method a barometer is placed at a bench mark of known elevation, and other barometers are placed at selected points along the line where readings are to be taken. Either by the use of two-way radio, or by taking a series of readings at known time intervals an accurate profile of the line can be plotted.

The profiling procedure, a part of the package service offered by the Williams Co., was first used on Texas Eastern's 774-mile, 30-in. line from Kosciusko, Miss. to Connellsville, Pa.

Equipment used for filling and pressurizing the line has been unitized and designed for maximum mobility in all types of terrain. It consists primarily of a small low-head pump located near a source of water, a main fill pump located near the pipeline with its suction line connected to the small low-head pump, and a pressurizing unit with its own 700-gal. water supply.

After a source of water for a particular pipeline section has been selected, a low-head pump is placed nearby at a point in the vicinity of the pipeline. A typical low-head pump is a 6-in. Gorman-Rupp Lo-Head pump, driven by a Chrysler engine, with a capacity of 2000 gpm. This pump is either towed or hauled from location to location by a pick-up truck.

A 6-in. line is laid from the discharge of this pump to the suction of the main fill pump, *(Fig. 1)* which is located at a point near the pipeline. The 6-in. pipe is light enough to enable two men to handle a joint with ease. The joints are connected by Victaulic couplings.

The fill pump is mounted on a trailer and is pulled by a diesel truck equipped with power take-off and winch lines. Gin poles are included to set the low-head pump in place and aid in setting manifolds, and for other miscellaneous purposes. In addition to the fill pump, the trailer has a permanently mounted 500-gal. fuel tank and a 3-kw generator. The 6-in. pipe used for a fill line is hauled in racks built on the side of the trailer, and necessary valves, couplings, fittings, tools, and miscellaneous supplies are hauled in a space provided behind the pump. A typical fill pump *(Fig. 2)* is the 6-in. Peerless, 3-stage centrifugal pump driven by 245-hp twin GMC diesel engines. This pump has a capacity of approximately 1300 gpm and a pressure of 500 psi.

On one section of Panhandle Eastern Pipeline Co.'s 24-in. line near Newton, Kan. approximately 90 miles of line was filled from one point with an average fill time of approximately 0.7 miles per hour. After this section had been tested the unit was dismantled, moved 100 miles, set up and began pumping operations again within a 24-hour period. The normal setup time for the unit is considered to be five hours.

The source of water to be used is selected by a preliminary investigation. A water survey is made to determine possible sources with respect to accessibility, chemical analysis, volume, and location. Where possible the pump is placed in a central location on the line so that water can be pumped in both directions.

A fill manifold is installed in the line, *(Fig. 3)* usually by the mainline contractor, and pigs, made up with 4, 5, or 6 rubber cups (but no brushes), are placed in the line to be pushed away from

the fill pump by the water. These displacement pigs remove the air from the line ahead of the water, and clean construction debris, such as skids, welding rods, and sand, out of the line.

After the line has been filled and fill pump pressure applied to the section to be tested, the pressure unit is connected into the section.

A typical pressure unit *(Fig. 4)* consists of a Wilson Snyder 36-P Triplex pump mounted on a 2½-ton truck, and driven by power take off mounted on auxiliary transmission. The truck also carries a 700-gal. water tank, and all connecting pipe, hoses, tools, and gauges necessary to conduct a test.

The pump is set up at a previously selected point along the line and high pressure Chiksan joints are connected between an outlet on the discharge side of the pressure pump and an outlet on the pipeline. Suction is taken from the 700-gal. water tank which is filled by taking water from a fill section back of the one being pressurized.

The gauges used for monitoring the test *(Fig. 5)* consist of an indicating gauge, recording gauge, and dead weight gauge. These are manifolded together and are set up 50 to 100 ft away from the line and connected to it by means of high pressure flexible hose. On a test in New Jersey conducted in below-freezing temperatures, considerable trouble was encountered due to the gauge line freezing. This problem was overcome by filling the gauge line with oil.

However, because of the viscosity of the oil and the small diameter of the gauge line, it was difficult to fill the line with oil. Because an oil pack had to be made every time the gauges were moved, or after a failure, a means of pumping the oil into the line was sought. A hydraulic jack used as a pump was found to be satisfactory for this purpose, and is now manifolded into the gauge set up as a permanent fixture. Now all gauge lines are filled with oil before each test. This practice also insures more accurate reading because the dead weight gauge is always filled with oil. All gauges are calibrated periodically.

This pressure unit is designed for maximum mobility and in tests on the Wilcox Trend Gathering System 16-in. and 14-in. lines in south Texas, one unit pressurized as many as four sections, covering 50 miles in a ten-hour period.

The number of fill and pressure units needed for a specific job varies with the terrain, pipe diameter, length of line, season, construction progress, and other factors. These factors are considered carefully by Williams' engineers, and a testing schedule is prepared and presented to the pipeline company before start of the test. As these factors change from time to time, the number of units is increased or decreased to comply with the current situation. For instance, on the Wilcox Trend mainline one fill and one pressure unit was able to keep up with construction progress for three months. As the speed of construction increased it was necessary to add another complete fill and pressure unit on the job for approximately 30 days to take care of a short-term requirement.

In comparison, on a section of Panhandle Eastern's 24-in. line in Kansas, certain pressure points along the line only 8 miles apart were as much as 45 miles by road. On such sections it was found to be advantageous to use two pressure units with one fill unit.

On the test of a cross country transmission line or line of appreciable length, the line to be tested is divided into fill sections and pressure sections, with a series of pressure sections comprising a fill section. The selection of a fill section is principally dependent upon the water supply and number of construction spreads working. Since there is a difference in pressures at high and low points along the line, a maximum allowable pressure differential is usually established. This is a determining factor in the selection of pressure sections. The sketch on page 95 illustrates the filling and pressurizing operation.

At points along the line where it is necessary to isolate a section for pressuring, a bypass manifold is installed. This manifold consists of a length of line-size-or-larger pipe, two weld caps, 2-in. blow-offs, a 6-in. bypass, and pressure and gauge connections. The manifold is furnished by the Williams company and serves as a temporary pig trap as well as a pressure point and means for

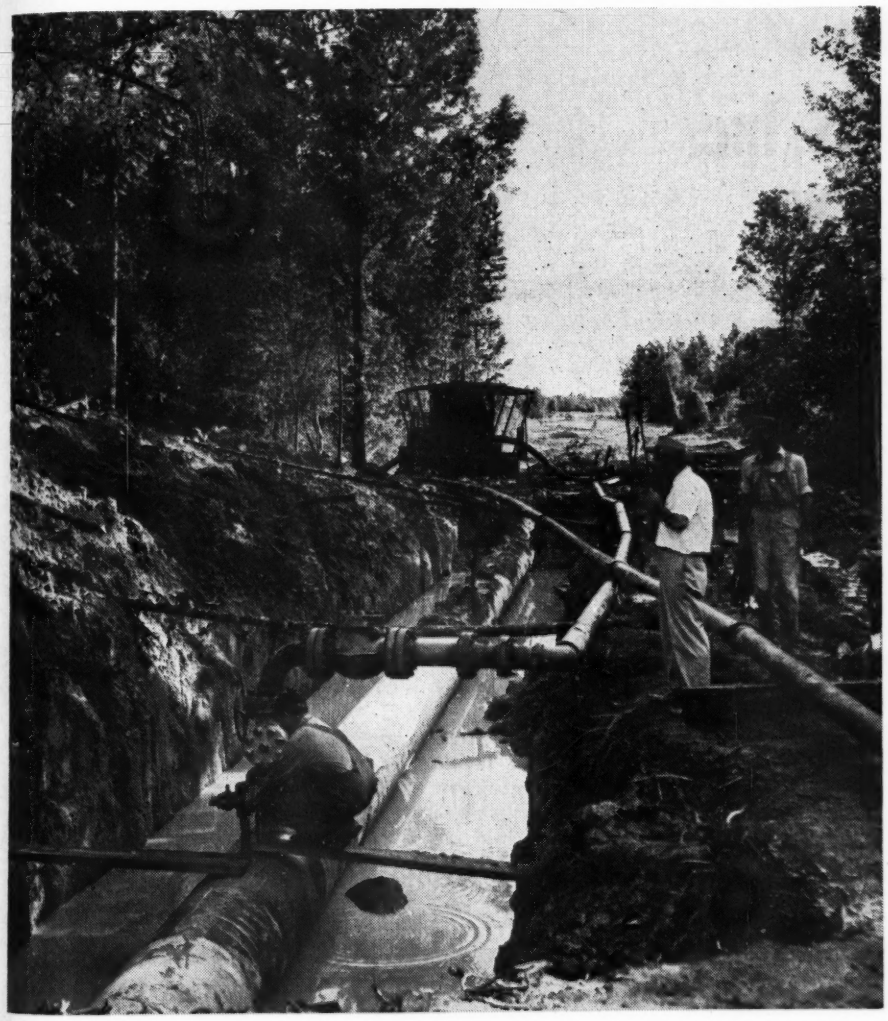

Fig. 3. One hundred and forty miles of 30-in. gas pipeline was filled from this point in a hydrostatic test on Texas Eastern's Mississippi line. The main fill pump in the background is tied into the line through the fill manifold in the foreground. Generally the fill manifold is located in such a position that water can be pumped in both directions.

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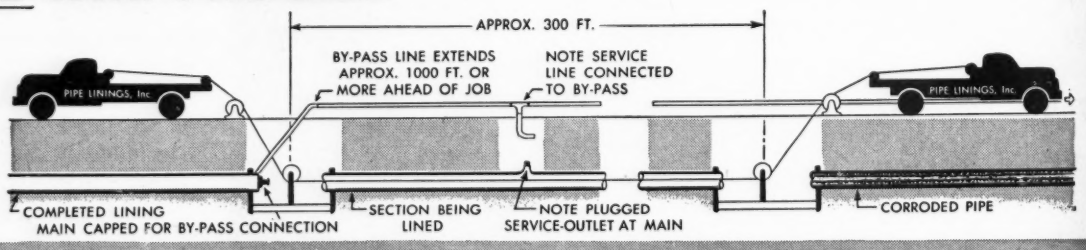
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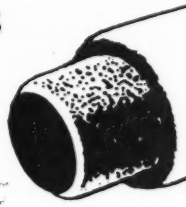

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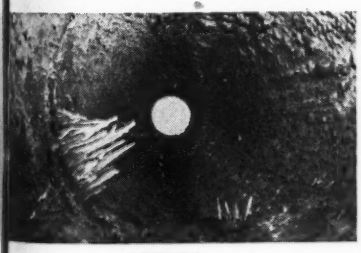

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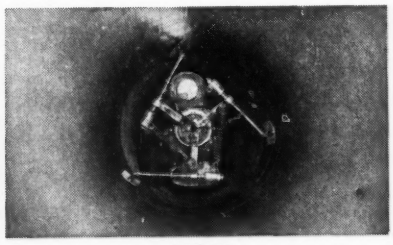

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Fig. 4. A hydrostatic pressure truck shown on location on a section of gas pipeline in Arkansas. The unit consists of a Triplex pump, truck mounted and driven by an auxiliary transmission. The truck also carried a 700-gal. water tank. The pump is set up to take water from a filled section and apply a pressure test to an adjacent section.

continuous filling. A "half" manifold is usually installed at each end of a filling section. In terrain where it is not necessary to sectionalize the line because of hydrostatic head, the line may be broken into sections formed by mainline block valves.

In filling a section of the line with water a blow-off valve, either on the main line or on a bypass manifold, at the end of the pressure section adjacent to the fill pump is opened to permit the air to escape ahead of the water. A displacement pig pushed by the water forces the air out of the line. When the pig reaches the end of a pressure section the blow-off valve is closed at that point and the next one down the line is opened.

This process is repeated until the displacement pig reaches a bypass manifold and comes into the trap, which is a part of the manifold. The manifold valve is then closed, the next one down the line is opened, and water is bypassed around the manifold. The water picks up another pig in the next section beyond the manifold and proceeds to fill succeeding sections in a similar manner. This procedure is carried out in both directions from the fill pump until the entire section is filled with water.

In the pressurizing operation, the pressure truck is first located at the main line valve or bypass manifold between the pressure section farthest away from the fill pump and the adjacent section in the direction of the fill pump. The suction line on the pressure unit is connected into the section toward the fill pump, and the discharge line is connected into the section away from the fill unit. Taking suction from behind, therefore, pressure is applied to the section to be tested.

After the test pressure has been reached and held for a specified period of time, the pressure unit is moved to the next main line valve or manifold in the direction of the fill pump and the same procedure is repeated.

Since the pressure unit always takes its suction from a section of the line in the direction of the fill pump, when the pressurizing operation gets under way the pressure in that section of the line will drop below 500 psi. This drop in pressure will be apparent at the fill pump, and the pumps will be started to maintain a pressure of 500 psi. In this way, as the pressure truck moves from section to section down the line it will always have a suction pressure of 500 psi.

If a section under test is found to be leaking, an investigation is made by Williams engineers to determine the location of the leak. In order not to delay pressure operations, however, a recording gauge is left on the section to record the pressure loss or breaking point.

After a section has been tested and accepted the pressure is released and a cleaning pig is forced through the line by either gas or air. Pigs previously loaded into the line at bypass manifolds are used to force the water out of the line. The number of pigs to be run, however, is determined by pipeline operating personnel, who are also responsible for taking dewpoint readings.

For testing highway, railroad and river crossings as well as other strategic points along the line, a somewhat different technique employing other types of equipment is put to use. A small pressure unit composed of a Mac No. 4 Macfarland pump, a water trailer for hauling water to fill the sections, and gauging equipment is used in this kind of operation.

A small pressure unit such as this may work as a part of a long line testing program or as a separate unit to test short sections only. In either instance the programming of the unit is coordinated with construction progress in such a way that a section is tested immediately after welding. In this way there is no delay in tieing the section into the main line.

On the Gulf Interstate Co.'s new 30-in. line, the crossings were tested in this manner with one unit working on spreads in Tennessee and Kentucky, and two units in Mississippi and Louisiana where progress was more rapid.

The final phase of the testing procedure is the compiling of records and charts and the presentation of a final report. The final report includes a complete description of the testing program, general procedure and equipment employed, description of fill sites and sections, and a general layout map. It also includes a summary of results and all test data, acceptance test reports and pressure charts, data sheets and a daily log of operations.

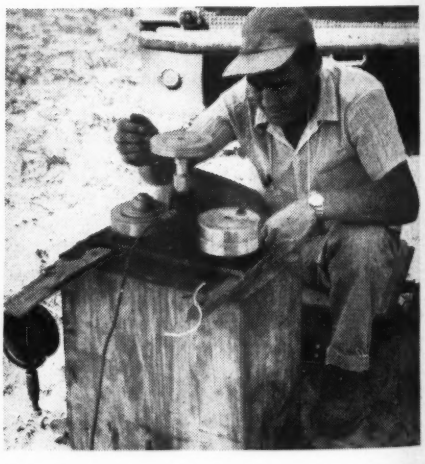
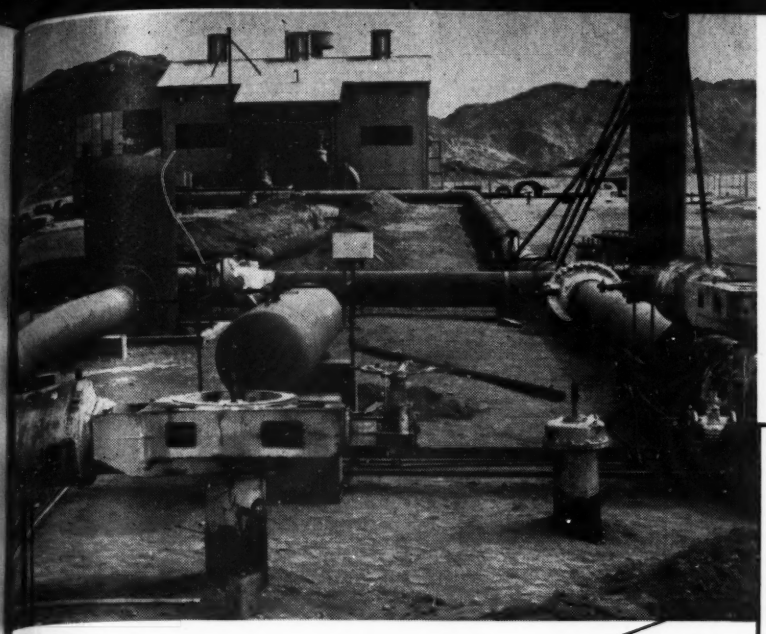
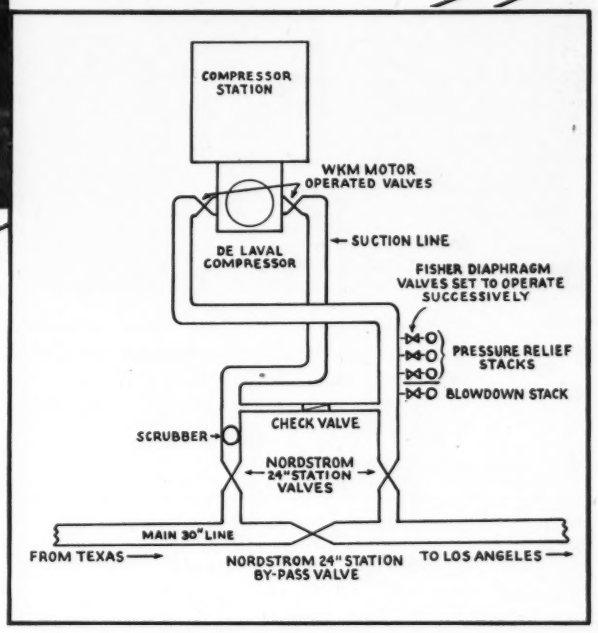


Fig. 5. A pressure gauging setup showing the dead weight gauge (on top of box) and dial gauge (lower left) which are manifolded together to make a constant reading of the test pressures. A recording gauge, also included in the series, is inside the box.





Above left: Desert Center booster station showing the layout of suction and discharge lines between the 30-in. main and the compressor building in the background. The centrifugal compressor is located on the compressor building porch with the suction line on the left and the discharge line on the right. The piston chamber and operating gear for the 24-in. mainline plug valve is in the foreground. The valve proper is on the mainline which is buried at this point. Station valves on the suction and discharge lines are on the far left and right of the picture. The small tank in the center is a compressed air tank for emergency operation of the shutdown valve system. Blowdown and pressure stacks with controls are at the right.

Above right: Design layout of the mainline valve control system on both desert booster stations, which is used to take the stations off the line. The mainline piston-operated plug valve, which is closed when the station is in operation, will automatically be caused to open by the plant shutdown system when the pressure in the discharge line is equal to the pressure in the suction line. The same automatic system also closes the two station valves, in suction and discharge lines, and allows the station system to blow down.

STATIONS IN THE DESERT

Twin plants will help boost capacity of original Texas-California line to 700 MMcf

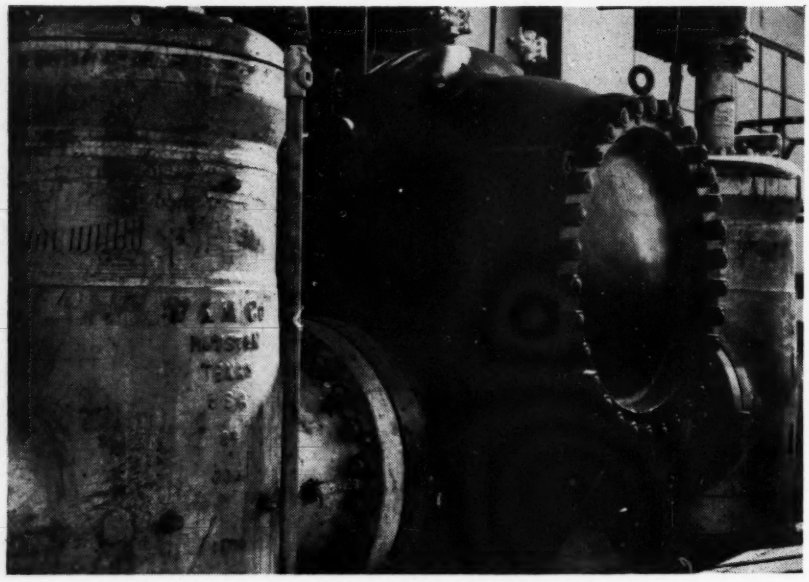
By **FRANK CHAPMAN** • Feature Editor

THE two southern California gas companies' continually expanding Texas pipeline is soon to have its daily capacity increased from 562 MMcf to 713.1 MMcf to round out—for the present at least—a phenomenal growth which started in 1947 when southern California received its first Texas gas from the El Paso Natural Gas Co.

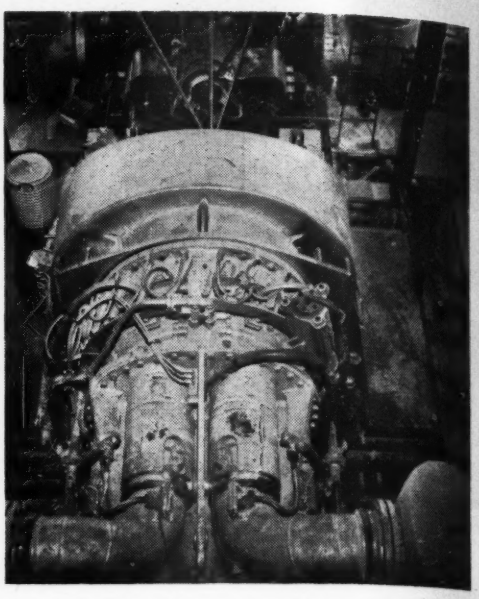
The expansion program is a combined effort of the Southern Counties Gas Co. and the Southern California Gas Co., two operating subsidiaries of Pacific Lighting Corp., which together serve a major portion of the southern California area as far north as Paso Robles on the coast and Visalia and Tulare in the central California valley.

In a still broader sense, the southern California companies' program is a part of a three-way development which includes the expansion of the Pacific Gas & Electric Co. facilities for serving northern and central California, and the El Paso Natural Gas Co. facilities for delivering more gas from Texas to its California customers.

The El Paso company, which expects to supply 60% of all gas sold by utility companies in California, will spend about $180 million to expand its line and transmission facilities from the Permian and



Outboard view of the centrifugal compressor at Cactus City, showing the full 24-in. motor-operated valves on suction and discharge lines. The outboard plate is removed when impellers and other internal parts of the compressor are changed to increase capacity.



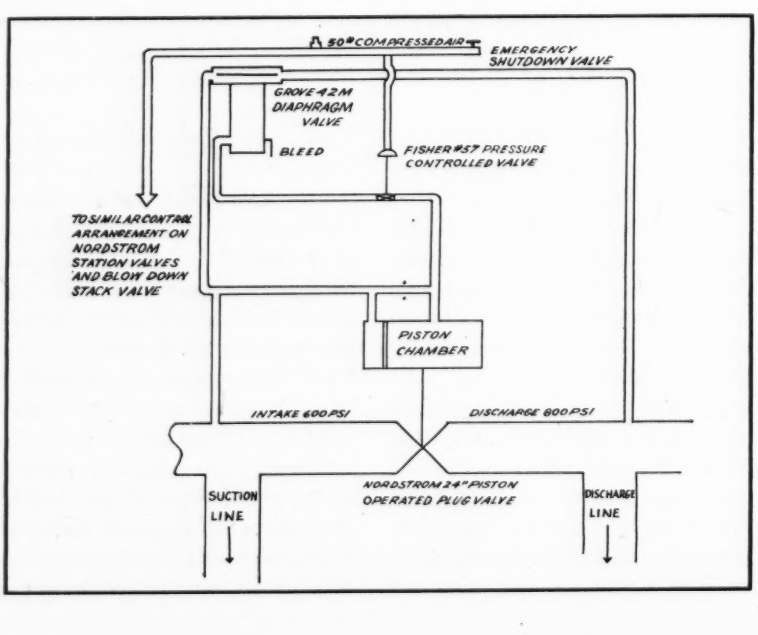
Looking down on turbine-compressor at Cactus City. Heated compressed air from axial flow compressor and regenerator to high pressure combustion chambers are in foreground. Low pressure turbine is in center. In background is centrifugal compressor, and suction and discharge line valves. Construction was not complete when this picture was taken and shaft between turbine and compressor was not in place.

San Juan basins to the California border (see *GAS*, May 1953). Construction now under way on the PG&E line between Topock, on the California side of the Colorado river, and its northern and central California load centers will increase their capacity to 700 MMcf per day (see *GAS*, April 1953).

Total expenditure by the four companies involved is expected to be in the vicinity of $215 million, with the El Paso company scheduled to deliver 1400 MMcf per day to the California border which will be divided about equally between the central and southern operating companies. Total expenditure by the California utilities will amount to over $40 million.

Already completed expansion of the southern California gas companies' Texas pipeline facilities includes two new Clark compressors at the Blythe station, eastern terminus of the line at the Colorado river; two new booster stations in the desert between Blythe and Indio; and 20-odd miles of loop line in the desert area. Total investment in this phase of the program has amounted to about $5 million. The loop line was completed late last winter, and the two new booster stations were put on stream for the first time in August 1953.

Pipeline layout of the two new desert stations showing the suction and discharge lines from the main 30-in. line to the compressor station, and the location of station and bypass valves.



Second phase

This fall also saw the start of the second phase of the expansion program which is to include installation of 73 more miles of 30-in. loop line and the addition of three more Clark compressors, adding 5280 hp, at Blythe. Contract for the loop line has already been let to the River Construction Co. of Ft. Worth with completion scheduled for late January.

This phase of the program also calls for alterations at both desert booster stations to bring their capacity to 713.1 MMcf per day. A pressure limiting station will also be installed on the new line at Whitewater, near Palm Springs. Expenditure in this phase of the program

is expected to approach $7.5 million.

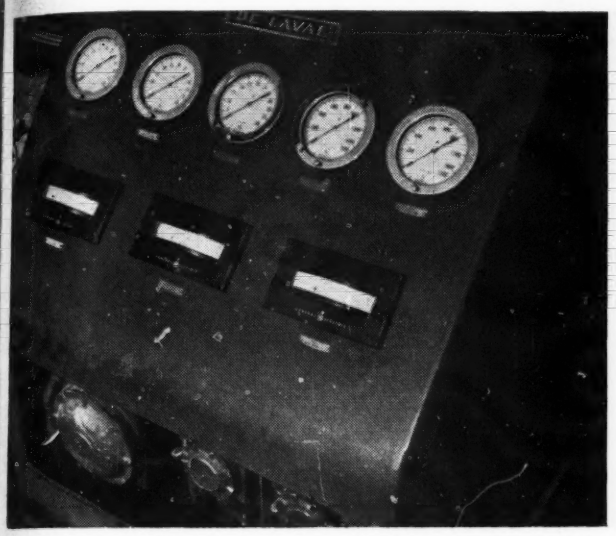
Provision for expanding the line is indicated in the design of the two new desert booster stations which are equipped with 5000-hp GE gas turbine-driven De Laval compressors. Installed capacity of each of the compressors, between 505 and 605 MMcf per day, is satisfactory for present pipeline requirements. However, with the installation of additional compressors at Blythe and the loop line, the capacity of the line will be increased to 713.1 MMcf per day, at which time the De Laval compressors will be altered to keep abreast of the increase. Impellers and other internal parts of the compressor are changed to provide the increase in capacity.

characteristic of the line as of completion of the presently proposed expansion program. Gas delivered by the El Paso Natural Gas Co. at the center of the Colorado river, at a pressure of 500 psi, has dropped to 480 psi at the Blythe station, six miles farther west. The Blythe station, with a compression ratio of 1.689, delivers a pressure between 755 psi and 807 psi, depending upon load. Maximum working pressure for this section of the line is established at 807 psi.

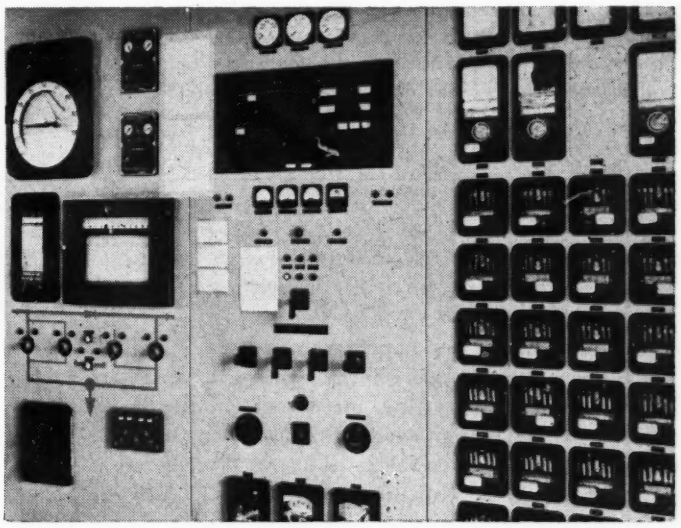
At a point six miles east of Desert Center where the looping ends, the pressure has dropped to between 695 and 750 psi. At Desert Center, the pressure is between 651 and 710 psi where the DeLaval installation, with a compression limiting station at Whitewater, 120 miles west of Blythe, limits the maximum downstream pressure of the line a second time to 655 psi; and a third limiting point at Olinda, another 80 miles west, again limits the maximum downstream pressure to 465 psi as the line approaches the metropolitan Los Angeles area.

Twin stations

The twin desert booster stations are designed so that they can be taken off the line and the station bypassed with a minimum of effort and in a minimum of time. In the case of an emergency shutdown the entire operation is accomplished automatically by a compressed



Gauge cabinet console for the centrifugal compressor at Desert Center. Gauges read the pressure of oil entering the compressor oil system from the turbine lubrication system, pressure of oil after filtering, pressure of oil to compressor bearings, seal oil pressure, and gas pressure. Meters on bottom row indicate temperature of oil entering compressor from turbine lubricating oil system, temperature of oil in thrust bearing, and temperature of oil in collecting tank.



Turbine control panel at Desert Center. Right panel contains starting and protective relays for turbine. An alarm board at top of center panel indicates abnormality in the system and sounds an alarm. Lower part of center panel contains starting controls. In center of left panel is a 48-point temperature recording chart which records temperature in 19 different places on turbine compressor. Pressure recorder at top of panel records station discharge pressure. At bottom are controls for valves on suction and discharge lines to compressor.

The two desert booster stations, one located at Desert Center, about 45 miles west of Blythe, and the other located at Cactus City, another 30 miles west, are basically identical in design. Outlay for both stations has amounted to $2,366,000.

Phase two of the expansion program will see $19,100 spent at Desert Center for necessary changes in the compressor to bring its capacity to 705 MMcf per day. A total of $90,600 will be spent at Cactus City for the same purpose together with additional loop line.

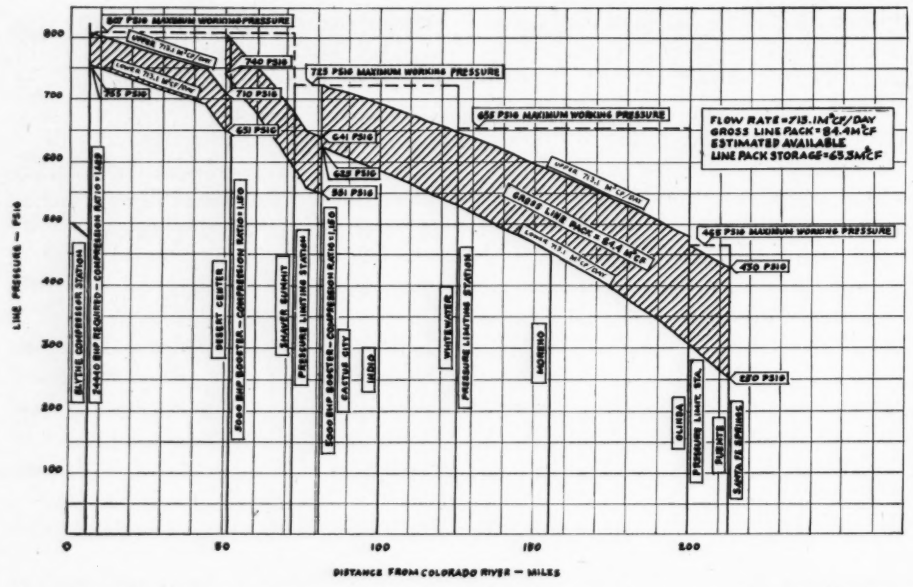
A pressure gradient curve based upon the maximum daily capacity of 713.1 MMcf per day shows the operating ratio of 1.150, returns the pressure to between 740 and 807 psi. In the remaining 25½ miles of unlooped pipeline, the pressure drops to between 560 and 650 psi. Suction pressure at Cactus City is between 551 and 641 psi where the high capacity, low compression ratio centrifugal installation delivers an output pressure between 625 and 725 psi.

Pressure limiting station

A pressure limiting station at Shavers Summit, 20 miles west of the Desert Center station, limits the downstream pressure to 725 psi. A second pressure

air shutdown system. Emergency shutdown stations are located at each gate and at strategic points about the station grounds.

A 24-in. piston-operated Nordstrom plug valve, located in the mainline at each of the stations, acts as a station bypass valve. The station suction line is taken off the upstream side of the valve, and the discharge line from the station is on the downstream side. Nordstrom 24-in. piston-operated plug valves in both suction and discharge lines serve as station valves. While the station is on stream the mainline valve is held closed by a Grove model 42-M differential con-


725 PSIG MAXIMUM WORKING PRESSURE
655 PSIG MAXIMUM WORKING PRESSURE
468 PSIG MAXIMUM WORKING PRESSURE
FLOW RATE = 713.1 MMCF/DAY
GROSS LINE PACK = 84.9 MMCF
ESTIMATED AVAILABLE LINE PACK STORAGE = 65.3 MMCF
430 PSIG
270 PSIG
LINE PRESSURE — PSIG
DISTANCE FROM COLORADO RIVER — MILES

Pressure gradient curves for the Texas pipeline from Colorado river to Santa Fe Springs showing design characteristics of the line at a flow rate of 713.1 MMcf per day with two new booster stations, additional loop line, and added facilities at the Blythe station all on stream.

troller. When the station is taken off the line, either for repair, in an emergency, or as a routine shutdown, compressed air is released from a Fisher diaphragm valve which opens the line between the Nordstrom piston chamber and the Grove regulator. When pressure is equalized on each side of the mainline valve, the Grove regulator causes the Nordstrom to open and bypass the station. The Nordstrom station valves and the blow-down stack on the discharge line also operate from the automatic compressed air system.

Bypass line

A 24-in. bypass line with a Chapman check valve connects the suction and discharge lines on the station side of the two station valves. This is used during short shutdowns when it is not desired to blow down the station piping.

A space of several hundred feet between the main 30-in. line and the booster station proper accommodate scrubbers, metering lines for fuel, and other station services. The spacing also provides a measure of safety if trouble should develop within the station. Suction and discharge line arrangement also allows for expansion and contraction of the line because of temperature change without danger of compressor misalignment.

Full 24-in. motor-operated WKM valves are located in the suction and discharge lines immediately adjacent to the compressor. The WKM valves, compressor, and compressor gauge cabinet console are all located on a small porch on the front of the compressor building. Direct current operating motors controlled from inside the compressor building are mounted atop each of the WKM valves.

The De Laval compressors are single-stage, single-suction centrifugal type designed for 5000 hp at 5000 rpm. Initial design is for 562 MMcf per day capacity at base pressure of 14.73 psi, and a base temperature of 60° F. Rated suction pressure is 605 psi and discharge pressure is 716 psi. Alteration of the compressor for additional capacity will, of course, increase this specification to 713.1 MMcf per day.

High pressure service

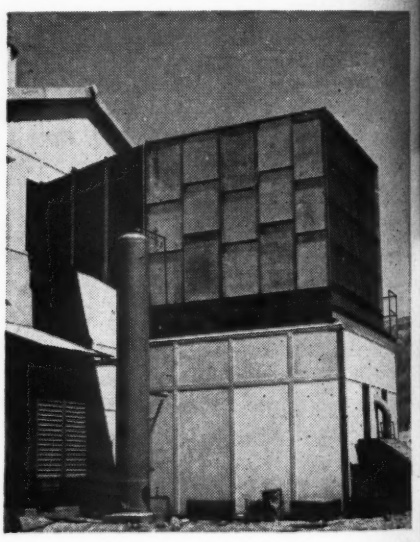
In high pressure gas pipeline service, an important consideration in design is a provision to prevent gas from escaping along the main high speed compressor shaft. The De Laval oil seal system consists of a seal chamber, surrounding the shaft between the compressor case and the atmosphere, which is kept filled with oil at a pressure higher than the gas in the compressor case. No gas can enter the seal chamber because of this pressure differential. Gas and seal oil pressures are shown on gauges located on the compressor meter console.

Seal oil is taken from the compressor lubricating system at about 12 to 15 psi and raised to a high pressure with a De Laval-IMO rotary displacement pump operating through a set of gears from the compressor shaft. A contact seal is used between the seal chamber and the compressor, and a close-fitting floating bushing is used between the seal chamber and the atmosphere. A differential pressure regulator automatically controls the seal oil pressure so that it is 25 to 75 psi higher than the existing gas pressure.

Contact seal

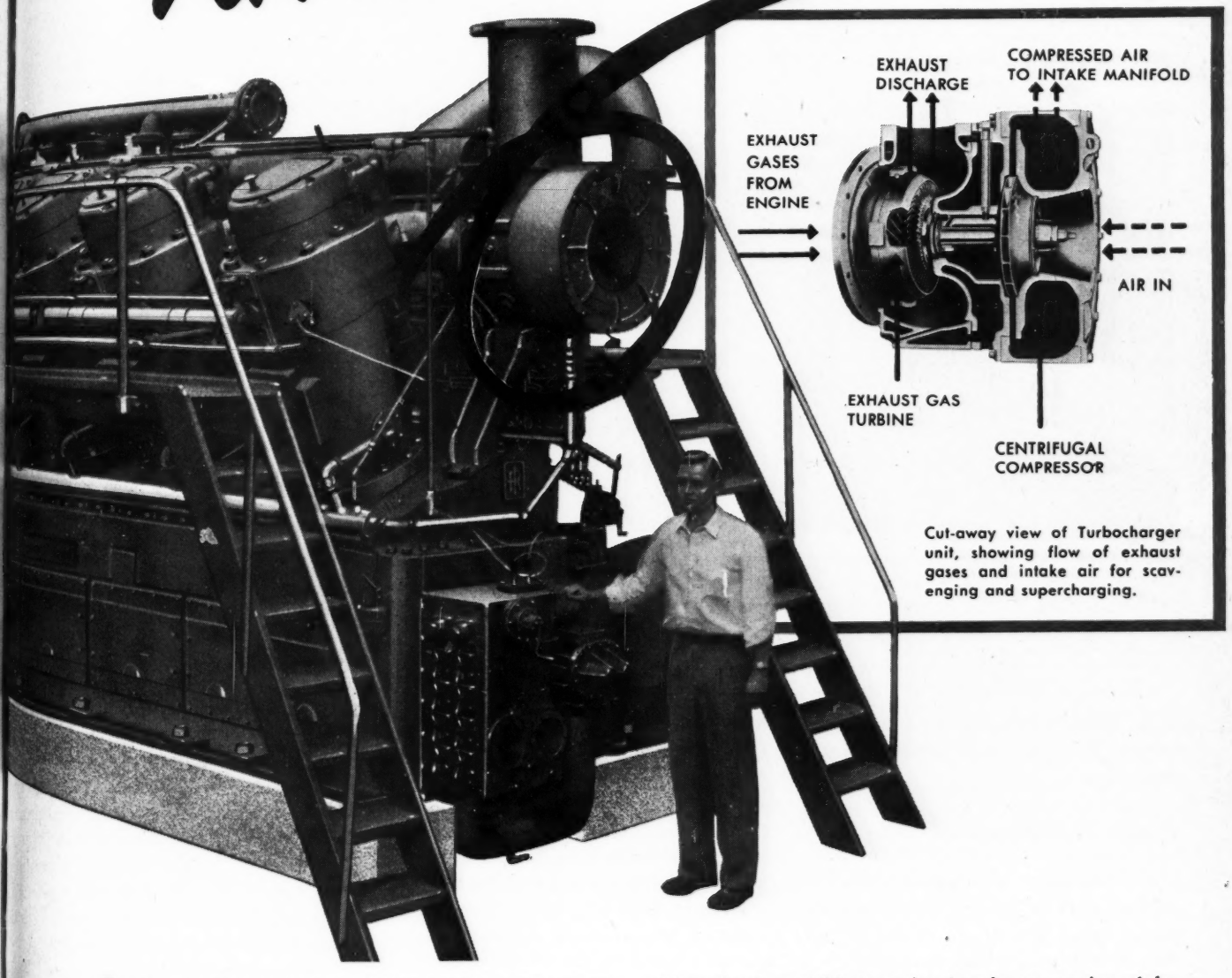
The oil passing through the contact seal is no more than 150 cc per hour, or about 3 gal. per day. This oil is caught in a trap arrangement and is drained into a high pressure tank which is emptied into the main oil sump periodically. The oil passing through the floating bushing at typical operating pressures is from 2 to 4 gpm, with the oil going to a collecting tank where it is degassified and returned to the turbine lubricating oil system.

An emergency seal oil tank and seal oil pump are included in the system. In case of an emergency, the gas pressure above the oil in the tank forces oil into the seal oil chamber, thus creating an oil-to-gas differential pressure across the inner seal approximately equal to the head of oil between the emergency tank and the seal. The auxiliary seal oil pump



Air washer and cooler mounted atop water filtering and softening building at Cactus City. Washed and cooled air is supplied to the turbine axial flow compressor inside compressor building at left. Tall tank in foreground is storage for water softening equipment. Intake filter built into building at left is for foundation cooling.

FOUR-CYCLE
gas-engine-driven compressor
IT'S TURBOCHARGED



Cut-away view of Turbocharger unit, showing flow of exhaust gases and intake air for scavenging and supercharging.

In the new TURBOCHARGED "KVS" engine, waste energy from the exhaust provides power for scavenging and supercharging, through two gas-turbine-driven centrifugal blowers, one at each end of the machine. The result—a new high in efficiency and economy! Savings in space, weight, fuel and cooling equipment make this an important advance in the design of Ingersoll-Rand's traditionally dependable V-angle, 4-cycle gas engine. Ask your I-R representative for the complete story.

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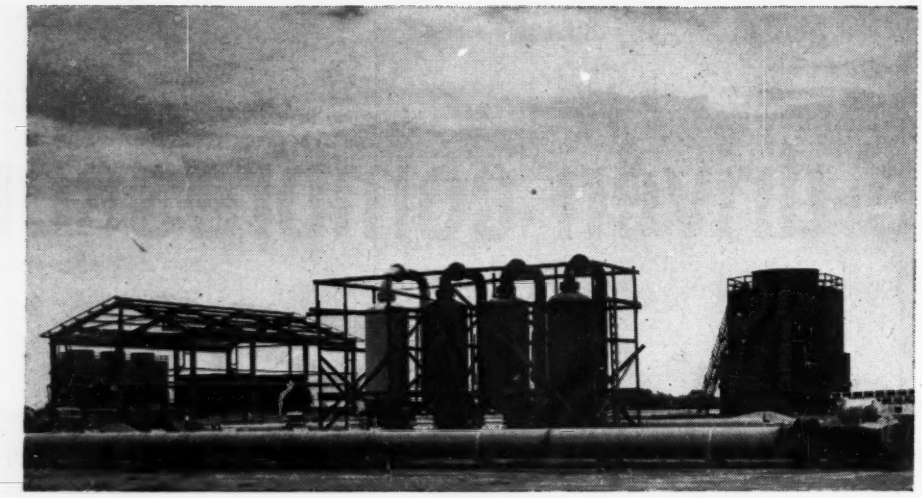
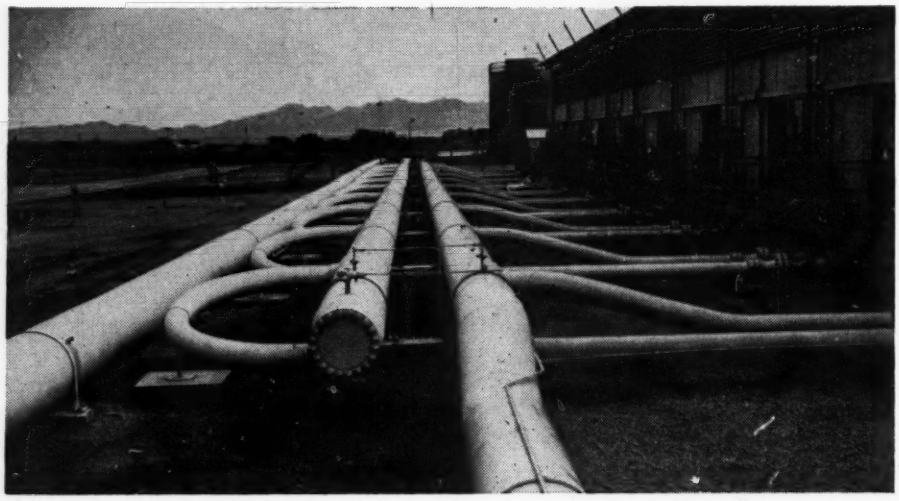


Newly added facilities at Blythe showing four new gas cleaners and suction line in foreground. New compressor building is at left rear with two of five compressors already in place. At right is a new cooling tower for cooling gas from new compressor installation.



Rear of the main compressor building at Blythe showing suction and discharge headers. On the left is a new line to the recently added compressors located behind the older compressor building. Center header is discharge header from the bank of compressors, and line on right is the suction line.

is a General Electric electric motor-driven De Laval-IMO rotary displacement type.

Design considerations

Of interest is the reasoning involved in the design of the two booster stations for an initial flow of 562 MMcf per day with provisions for increasing the flow to 713.1 MMcf at a later time. The alternative was an initial installation designed for 713.1 MMcf per day which would be operated at less than design capacity until such a time as line capacity caught up with station capacity. Station efficiency and its reflected cost of operation is the basic consideration.

The only alterations required to increase the capacity of the station to 713.1 MMcf per day are compressor changes. Compressor alterations involve changing to a higher capacity impeller with its complementary labyrinth and diffuser rings. Total cost of the changeover will vary with the installation, but is budgeted at both Desert Center and Cactus City stations at about $20,000 each, including labor. A minimum of downtime is required for making the alteration.

Loss in efficiency which results from operating a compressor designed for 713.1 MMcf per day at a flow of 562 MMcf per day is about 2%.

In terms of fuel consumption, arbitrarily computed on the basis of 10 cu ft of gas consumed per horsepower hour, this loss in efficiency is equal to about 1000 cu ft of gas per hour of operation. Additional fuel consumption resulting from this loss in efficiency, therefore, more than offsets the cost of alterations required to keep the compressor stations operating at more nearly the line capacity.

This is necessarily a generalized analysis of conditions surrounding power loss in terms of efficiency with operation at less than design load, and cannot be considered accurate for all specific installations. Other conditions can be included which change the picture to some extent, but the basic reasoning is no different from similar analyses in any machine operation of this kind.

Centrifugal Compressors

The centrifugal compressors at both desert stations are driven by 5000-hp General Electric regenerative cycle, two-shaft gas turbines operating at 5000 rpm. This type of prime mover is particularly adaptable to remotely situated desert stations such as Desert Center and Cactus City because the turbine requires only a small amount of water, primarily for nozzle cooling. Recirculated cooling water and lubricating oil is cooled in a pair of Coynco PowAirFin units.

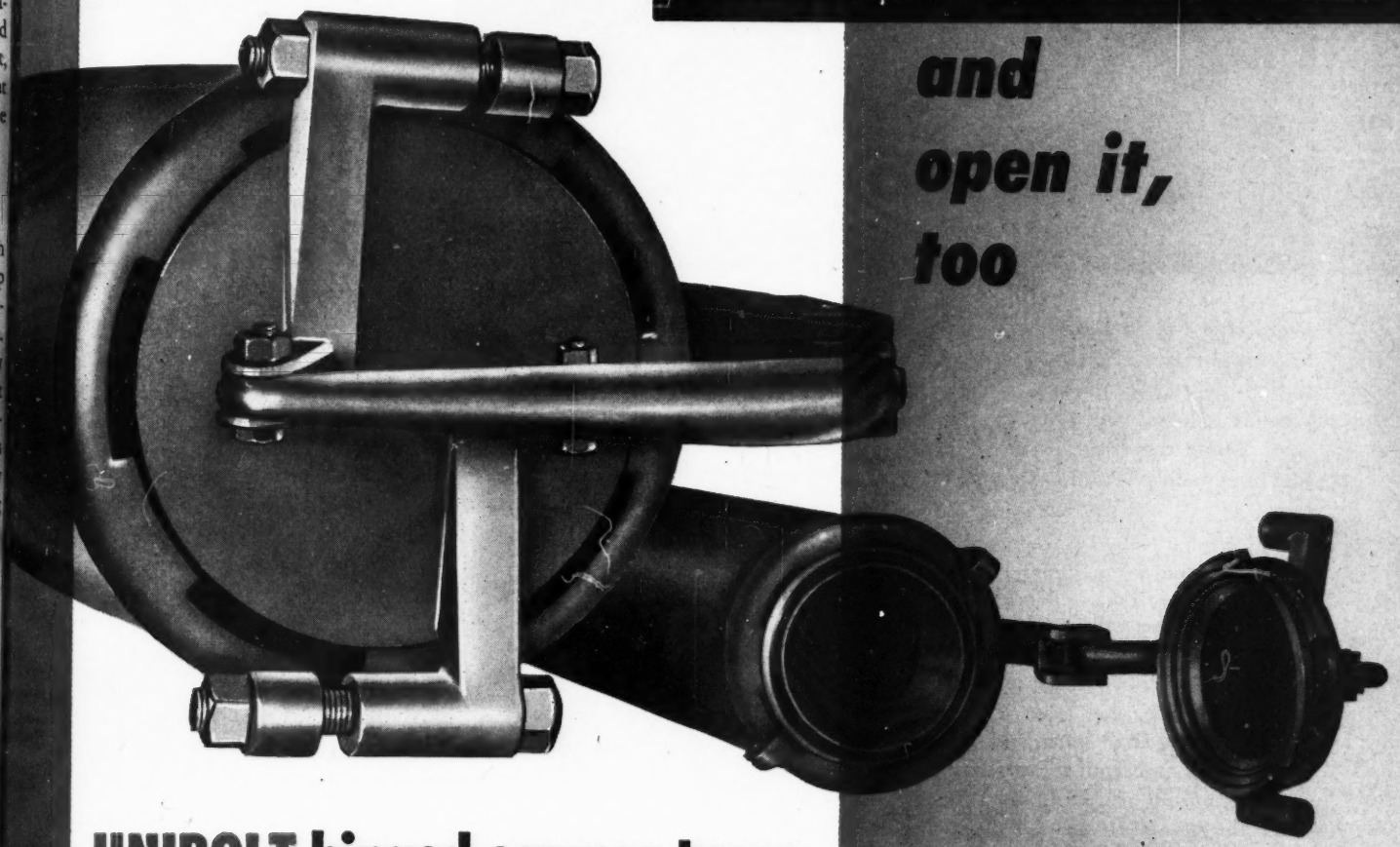
Because the gas turbine will deliver increased power output as the temperature of the incoming air is lowered, washed and precooled air is supplied to the machine through a Buffalo air washer. Low humidity prevalent on the desert is particularly adaptable to this operation. It is especially helpful that lower temperatures which increase load requirements on the line also cause the turbine to develop additional horsepower.

The incoming washed and cooled air is fed into the axial flow compressor from above the turbine. After compression it is heated to about 800° F with exhaust from the turbine combustion chambers, a process that considerably increases the efficiency of the turbine. The preheating takes place in a regenerator which is composed of 5100 vertically mounted tubes, where exhaust from the turbine is fed in at the bottom of a stack which contains the tubes and is vented at the top. The compressed air is heated as it passes through the regenerator from top to bottom.

Turbine fuel

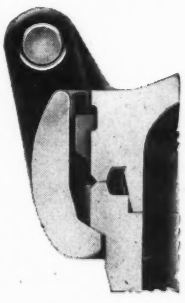
Turbine operating and starting fuel is taken from the mainline and metered separately. Running fuel is fed to the turbine through a 4-in. main turbine shaft. Starting gas is vented to the atmos-

the best way to Shut Your Trap!



and open it, too

UNIBOLT hinged scraper traps with self-sealing gasket



The self-sealing gasket is shown in cross-section at left. Note the lipped design of the gasket which makes it self-sealing under line pressure.

Just release two bolts and the Unibolt Hinged Scraper Trap swings open like a door. Close it and tighten two bolts. That's how simple and easy it is to operate. There's nothing to drop, no threads to leak, gall, or freeze, no multi-bolt flanges. The Unibolt design places a large area of metal in shear, consequently it is stronger and safer — no danger of failure under line surges or vibration.

Pipeliners everywhere are using Unibolt closures and couplings for scraper traps, blowdowns, strainers, mist removers, and other large diameter pressure vessels. Bulletin PL-510 presents the details on all Unibolt Pipeline Products. A copy will be sent gladly on request.

THORNHILL UNIBOLT CRAVER CO.

P. O. BOX 1184 HOUSTON, TEXAS

Six 16-in. meter runs at El Paso Natural's Ehrenburg meter station. Twelve-in. plug valves are on each end of the meter runs. Metering lines are taken off orifice fittings and run overhead to the metering house in background.

phere after use. A 1½-in. auxiliary fuel line supplies auxiliary engines and other station fuel requirements. Grove FlexFlo pressure reducing regulators and Powereactor Dome regulators are used on the fuel lines to drop pressure from the mainline.

Direct current voltage

Direct current voltage for all station controls is supplied from a bank of 60 Exide Manchex storage batteries. The batteries are charged from a generator on the turbine shaft when the station is in operation and from an auxiliary Buda gas engine driving a GE 75-kw generator when the station is idle.

A blowdown stack, located on the discharge line, is connected into the station automatic compressed air shutdown system. The line to the stack is opened by a piston-operated Nordstrom valve connected into the system which opens the mainline bypass valve and closes the two station valves.

Pressure relief stacks

Three pressure relief stacks are also located in the discharge line. They are controlled from Fisher piston-balanced, single-seated diaphragm regulator valves which are set to operate slightly above the maximum pipeline operating pressure. Each regulator opens and closes at the pressure for which it is set.

Additions to the Blythe compressor station, besides the two 1760-hp Clark compressors already installed and on stream, include three more Clarks and a new Fluor Counterflo cooling tower for cooling compressed gas from the new compressors. Also to be included in the new construction are four Blaw-Knox gas scrubbers and two Coynco PowAirFin fans for cooling water.

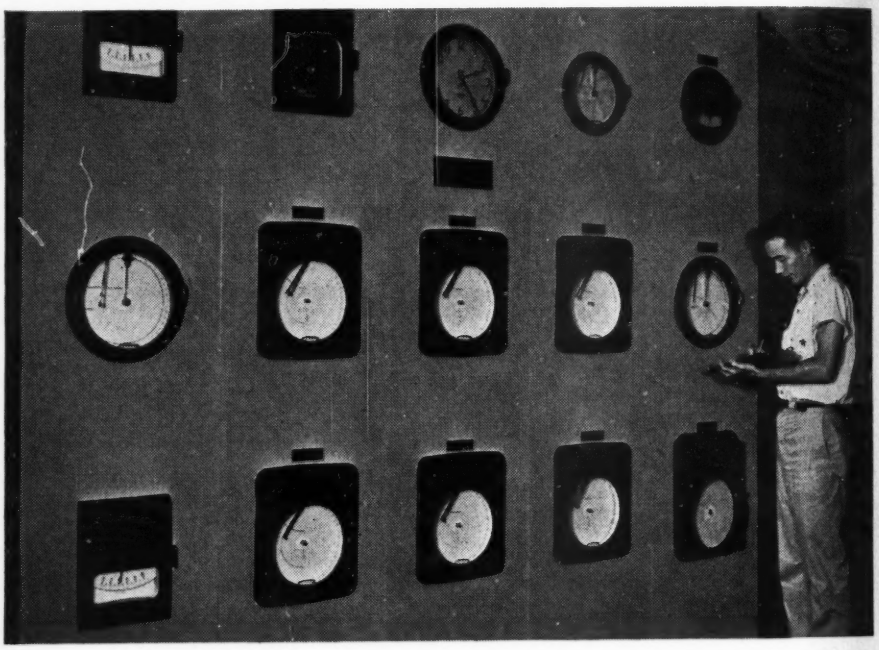
The new facility will more than double the total area occupied by the present station. Upon completion the new compressor building will house a total of five Clark compressors.

Metering station

Gas delivered to the southern California companies' Texas system by the El Paso Natural Gas Co. is metered at El Paso's Ehrenburg metering station on the Arizona side of the Colorado river where the line crosses the Colorado six miles east of Blythe. At Ehrenburg metering is done in six parallel 16-in. meter runs. A Bristol cycle timer alternately telemeters static and differential gas pressures to the Blythe compressor station.

Besides metering, the Ehrenburg station also records the Btu value of the delivered gas with a Cutler-Hammer calorimeter. A Titrilog continuously records sulfur content of the gas.

Additions to present metering and measuring facilities will be made to handle the additional load to the southern California customers.



Main metering panel at Ehrenburg. Six recorders in lower center of panel are connected to the six 16-in. meter runs which meter all gas supplied to the southern California companies' Texas pipeline at the center of the Colorado river. A static pressure transmitter (top of left panel) and a differential pressure transmitter (bottom of left panel), which alternately telemeters pressure readings to Blythe through the cycle timer (top of second panel from left). Center meter on left panel is an acerage flow recorder which reads the average amount of gas flowing in the six meter lines. Top recorder in third panel from left is an air temperature recorder, and the last meter in the top row is a gas pressure indicator. The middle recorder in right panel is a gas pressure recorder; below it is a gas temperature recorder.

Johns-Manville announces a new lightweight, reinforced asbestos pipe line felt . . .

New Transhield Asbestos Pipe Line Felt

. . . designed for low cost tear-free application

Transhield is a lightweight felt, reinforced with continuous glass yarns, parallel spaced on ¼″ centers to give tear-free application strength. Made of coal-tar saturated asbestos, Johns-Manville Transhield Asbestos Felt acts as a continuous barrier to shield pipe line enamels from earth loads and soil stresses.

As an outer sheath to retard cold flow, Transhield takes advantage of the full thickness of the enamel coating—working effectively toward preserving a continuous film of enamel on the pipe line.

Long-Length Rolls—Available in 800-ft. rolls (14″ O.D., 2″ I.D.) for traveling power-driven coating and wrapping machines. Other lengths can be furnished to suit your method of application. Widths are from 2″ to 36″.

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Johns-Manville has developed three wrapping materials for pipe line protection:

J-M 15-lb. Asbestos Pipe Line Felt (perforated or unperforated)—for severe soil conditions.

J-M Transhield Asbestos Pipe Line Felt—for average soil conditions.

J-M Trantex polyvinyl pressure sensitive tape—for pipe line corrosion protection where ease of application is important such as for emergency repairs and for coating field joints of mill-wrapped pipe.

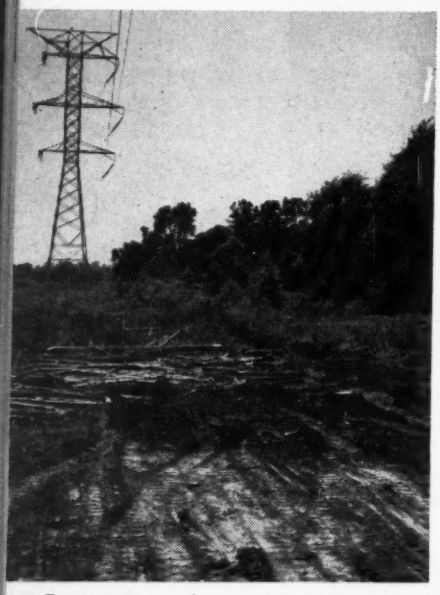
For further information write Oil Industry Department
Johns-Manville, Box 60, New York 16, N. Y.

JOHNS-MANVILLE JM PRODUCTS

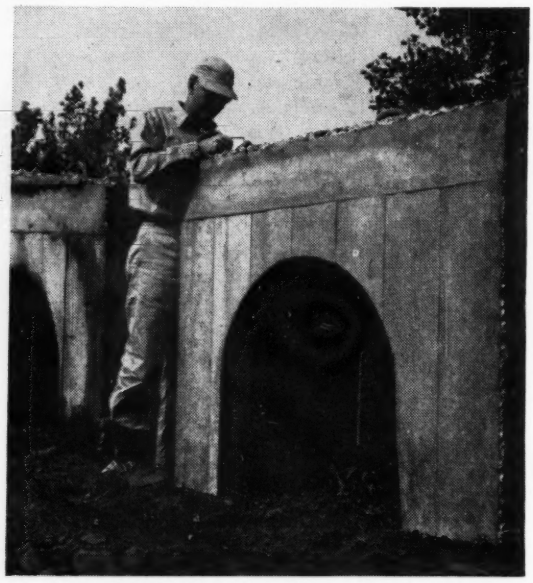
Johns-Manville ASBESTOS PIPE LINE FELT

That's 36-in. pipe, waiting for cleaning, priming, and coating before being laid in the ditch at the east end of the line (near Crawford station, whose holders appear in the background).

Just one of the numerous obstructions faced by the surveying crew—but gentle treatment by Engineers Herman J. Laude (left) and Lewis R. Warmington kept the cow from disrupting transit operations. First step in the construction job was taken in the wintertime, before the line had been approved.



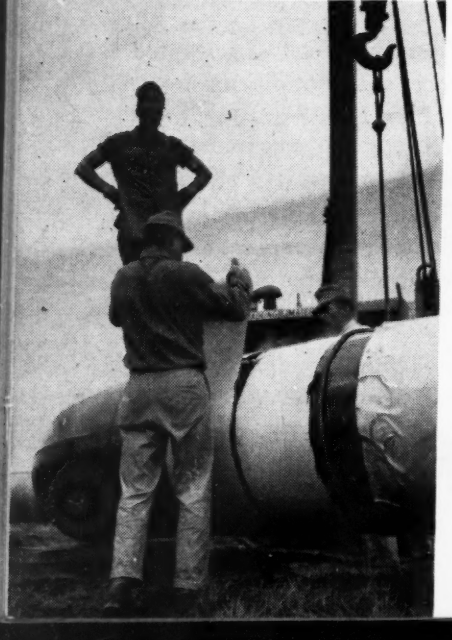
Equipment and material were moved through swampy territory over a temporary road laid on timbers cut from the right-of-way.



One of the 5700-lb concrete weights, which were fastened to the pipe in swampy areas, serves as an improvised desk for Engineer George Buzard.

Workmen coat and wrap with kraft paper a bend in a 36-in. line section.

Road boring machine burrows under a railroad spur. The casing is 36 in. in diameter.



Chicago District lays 36-in. pipe in new link line

SOME of the world's largest high-pressure gas pipe—36-in.—has gone into the ground near Chicago in recent weeks, where Chicago District Pipeline Co., a subsidiary of Peoples Gas Light & Coke Co., is completing the laying of the first portion of its 35-mile, $5 million feeder system.

When finally completed, the new line will bring consumers an additional 336 MMcf from Texas Illinois Natural Gas Pipeline Co. and Natural Gas Storage Co. of Illinois, two other affiliates. When first approved by FPC last April, the Chicago District certificate was packaged with a permit for Texas Illinois to construct compressor stations and loops to increase its capacity from 374 to 504 MMcf per day.

Chicago District's 1953 program, however, includes 19.3 miles of line, sufficient to increase capacity by 100 million.

The line runs from a tie-in point at Joliet, terminus of three Peoples' pipeline systems. Three-and-one-half miles

• STEPS IN X-RAYING THE 3000 WELDS

Photos courtesy Peoples Gas Light & Coke Co.

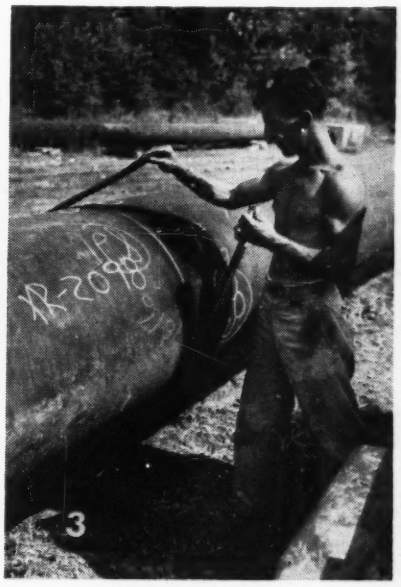
1. Peter Shunt (left), Peoples engineer, hooks up X-ray tube (already in the pipe) with crawler in preparation to X-raying welds. The crawler is equipped with a 250-volt reversible motor and rubber tread wheels.

2. Engineer Laude prepares to send the X-ray tube and crawler on their way by operating a control panel. The panel controls the X-ray tube, time element for X-ray operation, and shutoff of the X-ray tube when a man approaches.

3. Frank Bucaro ties an X-ray film strip around pipeline. The waterproof strip is lined with lead and contains screens and film.

4. Cab of X-ray truck houses a power take-off generator which operates the X-raying activities. Power is taken from the truck engine.

5. Welder applies corrective welding to a flaw detected by the X-ray machine.



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consist of 36-in. pipe; 30-in. pipe is used in 15½ miles, while two-tenths of a mile, comprising a crossing of the Des Plaines river, is 24-in. pipe with a 31/32-in. wall.

Inspection of some 3000 welds was accomplished by the internal X-ray method, using a self-propelled pig which gives 360-deg. radiographs on a continuous film strip placed around the weld.

Although, where possible, the line was laid in existing right-of-way or contiguous land, numerous hazards and obstructions faced the clearing and pipe-laying crews. Temporary roads had to be laid down in swampy territories to permit movement of heavy machinery, so trees cut down in the pipeline's path were used as a base. In some stretches, the line follows the course of high voltage power lines of Commonwealth Edison Co., so hand trenching was necessary under and near the towers to prevent possible contact of trenching machinery. In addition to the river, four creeks were traversed and tunneling was necessary under 21 railroad tracks and 29 highways.

Second link in the two-part program will be completed next year.

Construction was handled by Contracting & Material Co., Evanston, and the X-raying was done by Industrial X-Ray Engineers, of Elmhurst, Ill. The line was coated and wrapped with Perrault machines.

PIPELINE NEWS

Tennessee seeks to serve big New York market area

Tennessee Gas Transmission Co., Houston, is seeking to compete with Transcontinental Gas Pipe Line Corp. and Texas Eastern Transmission Corp. for the largest U. S. metropolitan gas market—the New York-Philadelphia area. Last month it asked FPC to approve its $45 million program to extend its service to this area and to develop additional underground storage facilities in Pennsylvania and New York. The storage fields would increase the system's peak day delivery capacity by 130.1 MMcf to a total of 2.1 billion cu ft per day.

Part of the new program calls for relocation of a line authorized on docket G-1573 in June 1952 but never built. This relocation would result in the construction of a new 243-mile, 24-in. line from the company's Hebron storage field in Pennsylvania to a point of connection with its New England subsidiary, Northeastern Gas Transmission Co., near Greenwich, Conn.

The June 1952 authorization had included a line which has been built, about 131 miles long from Mercer, Pa. to the Hebron storage area. A second leg extending from Hebron to a point near Utica, N. Y., with a loop on an existing line to the Massachusetts state line, has not been constructed and is the portion to be replaced by the new application.

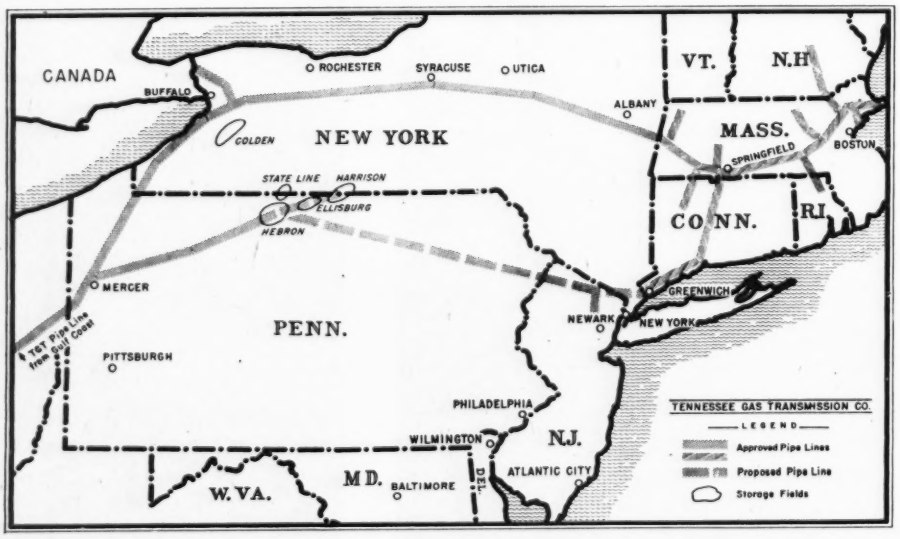
After hearing Tennessee's new plan, Transco, major supplier of the New York-Philadelphia metropolitan area, announced it is working on a plan to increase deliveries to the area also. It will probably take steps to intervene when Tennessee's hearing comes before FPC, President Tom P. Walker announced.

Consolidated Edison Co. of New York Inc. and Brooklyn Union Gas Co., both served solely by Transco at present, were listed among eight of the larger gas distribution companies to have signed contracts with Tennessee for substantial volumes of gas. In its application, Tennessee also asked FPC to approve increased sales to five of its existing customers by a total of 39 MMcf per day.

A key part of Tennessee's plans to serve the New York area is its proposal to expand its underground storage facilities in northern Pennsylvania and New York. In addition to the Hebron field, which it has begun to use, the company asked approval to acquire an interest in and develop, jointly with Iroquois Gas Corp., the Colden field near Buffalo; the Harrison field, principally in Potter county, Pa., Ellisburg field, also in Potter county, and the State Line field, astride the New York-Pennsylvania line, for development jointly with New York State Natural Gas Co. The five fields would give Tennessee a storage capacity of 77 billion cu ft.

In connection with its storage plan, the company has offered a new service on an option basis to the eight large gas distributing companies in the New York-Philadelphia area. Under the offer they could deliver gas in off-peak periods to Tennessee, who would store it and re-deliver it to them at the rate of 126 MMcf per day at times of heavy demand.

The companies Tennessee proposes to serve have contracted for the following volumes of gas daily: Consolidated Edison, now taking a maximum of 128 MMcf from Transco, 10 MMcf; Brooklyn Union, now receiving 70 MMcf from Transco, 25 MMcf; and Long Island Lighting Co., Mineola, N. Y., who receives 35 MMcf from Transco, would take 5 MMcf. Also listed as proposed customers were Philadelphia Gas Works Co., 20 MMcf; Philadelphia Electric Co., 30 MMcf; Public Service Electric & Gas Co., Newark, 30 MMcf; South Jersey Gas Co., Atlantic City, 4 MMcf; and Delaware Power & Light Co., Wilmington, 2 MMcf.



Map shows lines approved and proposed to be built by Tennessee Gas Transmission Co. to complete system for service to New York-Philadelphia metropolitan area.

New firm would build new Louisiana-Detroit line

American Louisiana Pipe Line Co., New York, has filed with FPC for authorization to construct a 1200-mile, 30-in. gas line from fields west of New Orleans to Detroit, where it will connect with Michigan-Wisconsin Pipe Line Co. Cost of the project has been placed at $130 million. The line will have compressors totaling 30,000-hp.

American Louisiana is a newly formed subsidiary of American Natural Gas Co. Michigan-Wisconsin and Michigan Consolidated Gas Co., also subsidiaries of American Natural, will purchase all the gas to be carried by the huge line, which will have an initial capacity of 300 MMcf of gas a day, or 109 billion cu ft per year.

The company said its new line will permit removal of all restrictions now in effect on the sale of gas for heating and other purposes by utility customers served by Michigan-Wisconsin. Both Michigan-Wisconsin and Michigan-Consolidated will enlarge their facilities to handle the added gas.

The company has secured reserves which will insure the 300 MMcf per day delivery for at least 20 years, it said. It will purchase about 250 MMcf per day from Louisiana producers and about 50 MMcf daily from Texas Gas Transmission Corp. near Slaughters, Ky. The principal southern producers are Stanolind Oil & Gas Co., Superior Oil Co., Gulf Refining Co., Humble Oil & Refining Co., British-American Oil Producing Co. and Kerr-McGee Oil Industries Inc.

Texas Gas plans expansion to serve proposed line

The Texas Gas Transmission Corp., Owensboro, Ky. has placed an application before FPC seeking authority to build a new pipeline with compressor facilities between Memphis, Tenn. and Slaughters, Ky. to enable it to deliver an average of 50 MMcf per day of "off-peak" gas to the new Louisiana-to-Detroit line planned by the American Louisiana Pipe Line Co.

The new facilities include 48 miles of loopline and additional compression at one compressor station. Estimated cost of the project is $4,280,000.

The company said the "off-peak" gas sale and new facilities will benefit Texas Gas and its customers in several ways. The load factor of the system will be improved, using the full capacity in the southern part of the system more consistently, and the company and its stockholders will receive the advantages of a more diversified marketing area, the application said. W. T. Stevenson, president of

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Texas Gas, also pointed out that the interconnection of the two systems will provide a safeguard to both companies in event of outages or emergencies. He said that gas supplies necessary for the proposed sale have already been acquired.

Drilling tests show two new Alberta gas fields

Canadian companies have recently reported tests which appear to indicate two new gas fields and extension of the third. Largest of the finds was made by the Canadian Northern Oil & Gas Ltd. and Pacific Petroleums Ltd. in a well showing three productive zones with approximately 100 ft of gas bearing zone in the Cadotte sands.

Located in Alberta's Peace river district, about 12 miles south of the Pouce Coupe gas field near the British Columbia line, the well showed a top flow of over 2.9 MMcf per day at 3263 to 3678 ft. The hole was carried to the top of the Triassic at 6110 ft where it showed a 2.5 MMcf flow.

Pacific Petroleums and Royalite Oil Co. Ltd. have made a two-mile eastward extension of the Pouce Coupe gas field in the Cadotte sand in a well which is being carried down to the Cadomin for tests. About 50 ft of gas zone beginning at 2285 ft showed a top flow of over 2.7 MMcf per day.

A group of independents has carried out initial exploratory drilling in the Kessler area of central east Alberta and have found a gas field in the Viking sand. Located about 145 miles northeast of Calgary, the project has three successfully completed wells in a 10-mile stretch. No official figures have been released but estimates are that gas bearing sands range from six to 15 ft in the three wells with a calculated gas flow rate up to 67 MMcf daily.

Certificates and stay of limitation order granted

The Federal Power Commission has issued certificates affecting seven Columbia Gas System subsidiaries authorizing construction of facilities estimated to cost $6.5 million.

Certificates were issued to Central Kentucky Natural Gas Co., and jointly to Atlantic Seaboard Corp. and Virginia Gas Transmission Corp., all of Charleston; to Cumberland & Allegheny Gas Co., Home Gas Co. and jointly to Manufacturers Light & Heat Co., Natural Gas Co. of West Virginia, all of Pittsburgh.

In a concurrent order the commission granted a motion to stay the limitations previously imposed on the maximum daily volume of gas transported through the systems of these seven companies and two other Columbia subsidiaries—United Fuel Gas Co of Charleston and Ohio Fuel Gas Co., Columbus.

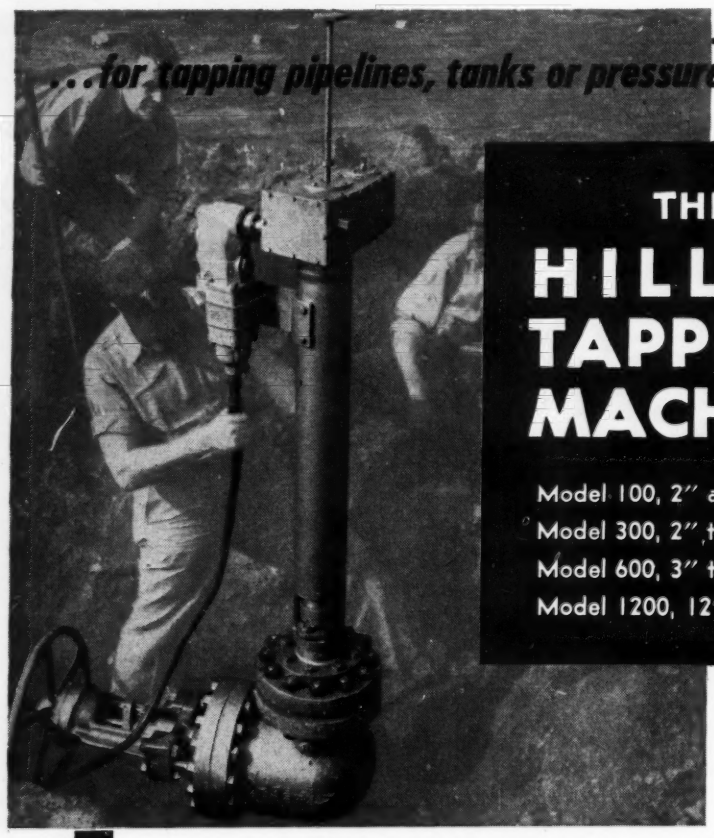
The issues date back to an order of May 1 which granted certificates to several Columbia companies and set limits on the daily volumes to be transported. FPC said the estimated gas supply to the Columbia system will be adequate to meet anticipated full peak day requirements during the 1953-54 winter season and there appears to be no present necessity for continuing the limitations. Hearings are to be resumed at a date to be fixed by further order.

Gas company 1952 revenues more than $2 billion

Expanding operations in the natural gas industry are evident in the FPC statement that filings of 150 natural gas companies annual reports show that operating revenues for 1952 exceeded $2 billion.

Excluding companies reporting which were not predominantly in the natural gas business, sales of natural gas amounted to 7.10 trillion cu ft. This amounts to a 9.4% increase over sales of 6.47 trillion cu ft of gas in 1951. Service was supplied to an average of 7,270,000 customers during 1952 compared to an average of 6,837,000 during 1951.

Latest reports show the upward trend still in force as the gas companies report operating revenues of $152,801,991 in August



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of 1953, an increase of 20.7 percent over August 1952. For the 12 months ending Aug. 31, 1953, revenues aggregated $2,227,106,988, or 21.8% higher than the $1,326,509,847 received in the previous 12-month period.

Mid-Georgia authorized to serve three communities

FPC Presiding Examiner Ewing G. Simpson has filed a decision (docket Nos. G-1277, G-2015, G-2114), subject to review by the commission, authorizing Mid-Georgia Natural Gas Co., Atlanta, to construct and operate facilities to supply gas to Porterdale, Conyers, and Millstead, Ga. Estimated cost of the system is $550,000.

The decision also modified an order whereby Transcontinental Gas Pipe Line Corp., Houston, will supply gas to Mid-Georgia for this service rather than to Newton County Gas Co. as previously authorized. Mid-Georgia has acquired certain franchises and a portion of the system already constructed by Newton.

The decision denied Mid-Georgia's request that the commission declare it to be engaged only in the local distribution of gas. Examiner Simpson found that the company's facilities are and will be operated for transportation of gas in interstate commerce, and that it is therefore subject to jurisdiction of FPC.

Independents form group to revive common carrier

Aimed at reviving the common carrier provision in the mineral leasing law, an organization headed by John Wight, president of Mondakota Gas Co., Billings, Mont. had its first meeting Oct. 29 in Denver. This group of independent gas producers appealed to "all those interested in maintaining a competitive market outlet for natural gas" to join them.

Mondakota is the only independent gas shipper now using a gas line under the common carrier provision. It supplies several industrial plants in the Black Hills area with gas from the Baker-Glendive anticline in the Williston Basin through a line owned by Montana-Dakota Utilities Co.

The common carrier provision for gas lines was repealed by the Poulson bill (HR5664). (See August *GAS*, page 21.)

Production company enters eastern market; buys Reno

In one of two major moves to place it in the eastern production picture, the Tennessee Production Co., Houston, an affiliate of Tennessee Gas Transmission Co., has purchased all the oil and gas properties of the recently liquidated Reno Oil Co., a 45-year-old West Virginia firm. Ownership of nearly 2000 producing wells changed hands in the

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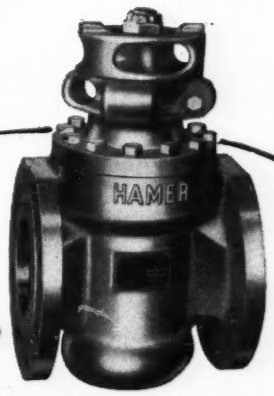

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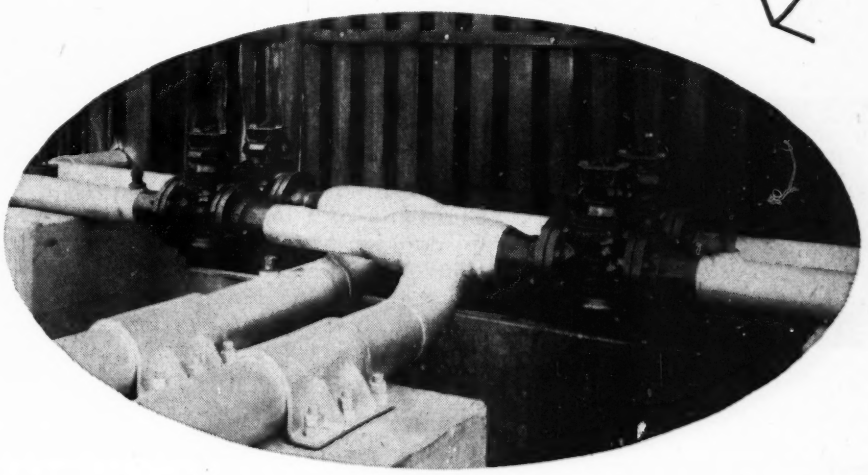

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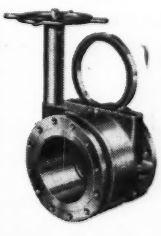

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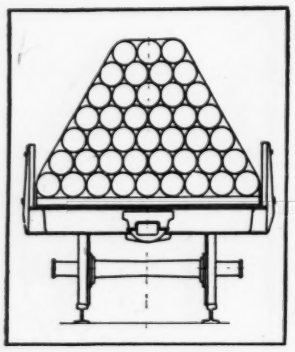

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transaction. The 225 former operating employees of Reno have joined Tennessee.

The Reno properties are located in Texas, Oklahoma, New Mexico, West Virginia, Ohio, Kentucky and Pennsylvania. They include 878 producing wells in Texas and Oklahoma and approximately 1100 wells in other states.

Tennessee has also announced its first gas production in the northeastern area with the completion of two gas wells in the Benezette field in Pennsylvania. The third and fourth wells were scheduled for early completion and two more are being drilled. The field, largest found in Pennsylvania in the last 30 years, was discovered in 1952.

Line to serve Columbia, Charleston under way

Construction on a 152-mile pipeline that will carry gas to Columbia, Charleston and Summerville, S. C., was nearing completion as *GAS* went to press. South Carolina Natural Gas Co. has built the line from a connection with Southern Natural Gas Co. at Aiken, S. C. It forks at Salley, S. C. with a 32-mile branch to Columbia and about 87 miles of line going to Charleston.

The company has contracted to take 30 MMcf of gas daily from Southern Natural to serve these cities and supply gas wholesale to Bamberg, Denmark, Orangeburg and Walterboro when these towns get their own distribution systems.

The Office of Defense Mobilization has approved a rapid tax write-off for South Carolina on 25% of the $5,745,500 it expects to spend on its transmission line project.

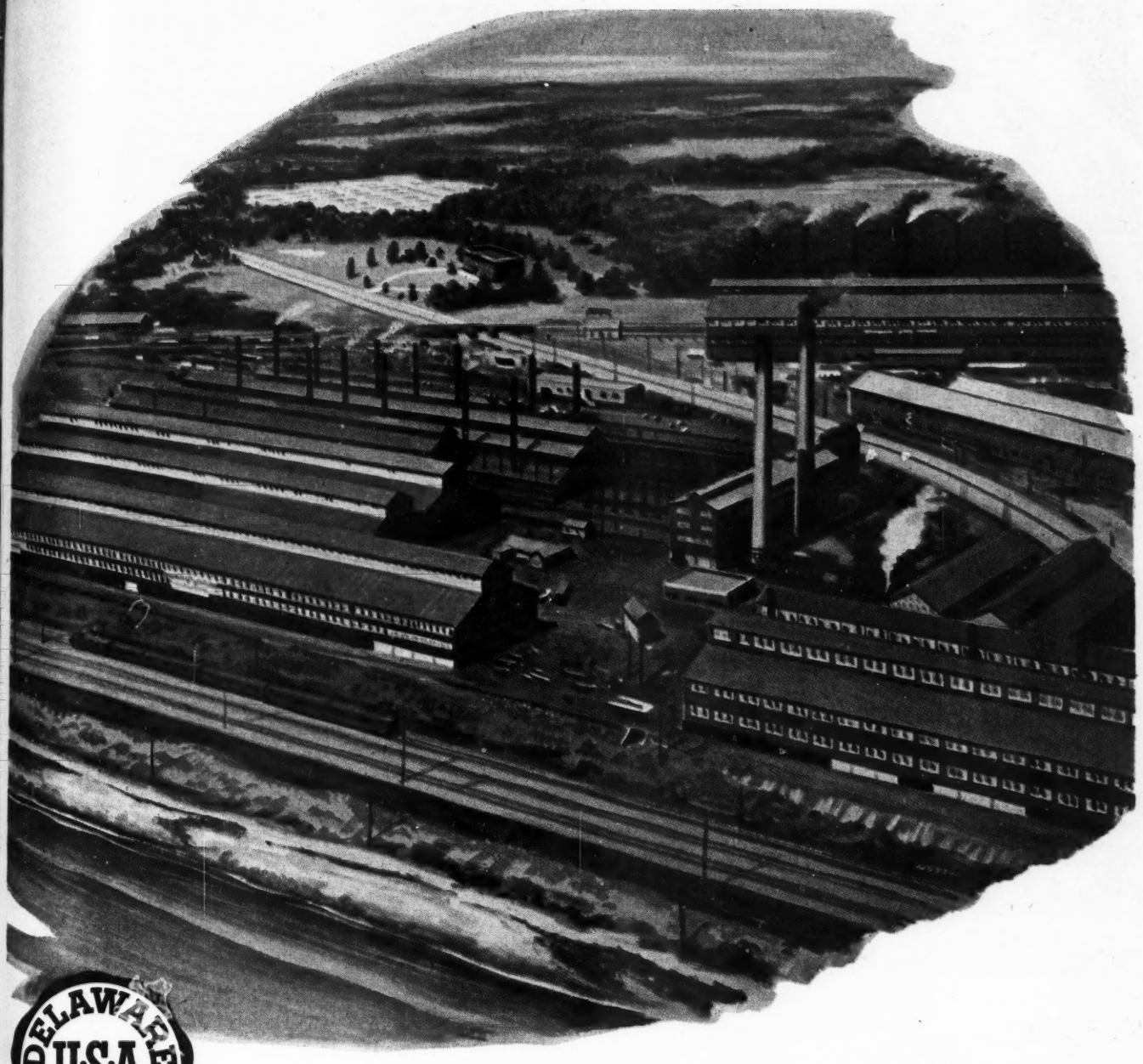
Big discovery in San Juan basin called "significant"

The biggest well in the history of San Jaun basin gas development has been reported by El Paso Natural Gas Co. The well was brought in from the Pictured Cliffs formation. New Mexico state geologist Richard R. Spurrier said the discovery is "very significant" and indicates more gas reserves in that formation than previously known.

The well, which tested 8.8 MMcf of gas a day after it had blown wide open for 14 hours, is located east of Gobernador in Rio Arriba county in the eastern part of the basin. That is the area involved in the application of Pacific Northwest Pipeline Co. in its proposal to serve gas from the San Juan basin to the Northwest by a new pipeline.

Sulfur from gas declared exempt from Texas tax

A recent ruling by District Judge Jack Roberts in Austin, Texas, declared sulfur extracted from oil-well gas to be exempt from the Texas state production tax under present law. The opinion upheld Phillips



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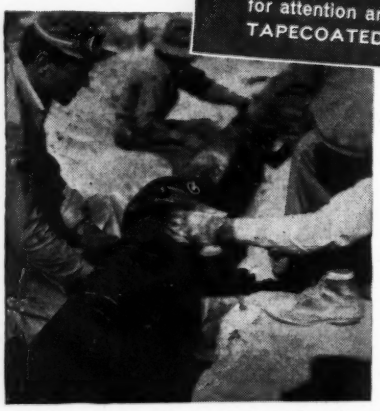
PROOF (Above ground)—A gas line at a bridge crossing was TAPECOAT-protected in 1944. There has been no need for attention and *no interruption of service* since the pipe was TAPECOATED.



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Chemical Co., which has been paying the tax under protest on sulfur obtained from sour residue gas in Ector and Crane counties.

More than $100,000 is tied up in the state treasury by companies seeking refunds on sulfur. State Attorney General John Ben Shepperd had contended that sulfur is subject to the state production tax of $1.40 per ton regardless of production methods used. Most sulfur produced in the state comes from mines on the Gulf coast.

Morton county line planned for more gas to Chicago

A recent application (docket No. G-2269) to FPC asks permission for Colorado Interstate Gas Co., Colorado Springs, to build 49.5 miles of 20-in. line from Morton county, Kan. to a point near Hooker, Okla. The new facilities would enable it to deliver nearly 20 MMcf additional gas per day to Natural Gas Pipeline Co. of America.

Interstate's project, expected to cost $3,604,950, also includes a dehydration plant in Morton county and a delivery meter station at the Hooker, Okla. end of the line. It would also expand its gathering system in the Morton county field.

In a separate application (docket No. G-2282) Natural is seeking authorization to install a 1250-hp compressor unit at a station near Hooker and build 2750 ft of 24-in. line connecting to the station, at a cost of approximately $665,000.

SoCal buys Playa del Rey gas storage reservoir

The general services administration, Washington, D. C. has approved the purchase of the Playa del Rey gas storage reservoir by Southern California Gas Co., Los Angeles. Purchase price is $2,150,000.

F. M. Banks, SoCal president, said the company has been using this partially depleted oil field to store gas for peak-day use under an agreement with the government drawn up in 1942 following government condemnation of the property, for this purpose. The property was offered for public sale in June of this year. SoCal's bid, the only one made, has been under review by the general services administration since that time.

Authorization to serve Georgia towns denied

Authorization on docket G-2066 was denied Chattahoochee Natural Gas Co., Birmingham, Ala. to construct a 70-mile pipeline to supply natural gas to four communities in northwest Georgia. Southern Natural Gas Co.'s application (docket G-2065) for authority to build a line tap and metering and regulating facilities to supply Chattahoochee was also denied.

The FPC said Chattahoochee's system, which has an estimated initial cost of about

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$1,540,000, is dependent upon the development of the consumer market in the communities of Dalton, LaFayette, Summerville, and Trion. It declared, however, that evidence does not support the forecast that municipal markets will develop as required to make the project economically feasible. The order does not preclude reapplication by Chattahoochee at some future date, the commission said.

API offers course in gas production handling

The American Petroleum Institute's division of production is now offering a vocational training course covering the handling of natural gas. The course was developed by the University of Texas under a grant-in-aid from API. It is primarily intended to train company employees in the gathering, treatment and control of gas on a producing lease, but also includes material applicable to some phases of natural gasoline plant operations.

Instructors are full-time professionals employed and specifically trained by the state departments of vocational training. the course includes 10 periods of three hours' instruction. Course equipment is mounted on a truck and has a complete miniature model flow system, including separators, heaters, treaters, etc.

United Gas writes off synthetic gas investment

United Gas Corp., one of eight original sponsors of the Carthage Hydrocol Inc. synthetic gas plant at Brownsville, Texas, is writing off its $3,775,808 investment in the project as a complete loss. The plant was ordered closed down earlier this year (see August *GAS*, page 108).

Other sponsors also are reported ready to write off their investments in the project to avoid RFC foreclosure proceedings. Other sponsoring companies are Texas Co., Forest Oil Corp., Niagara Share Corp., La Gloria Corp., Gulf States Oil Co., Stone & Webster Engineering Inc., and the Chicago Corp.

TGT files suit to recover 1948-49 income tax

Hoping to recover $724,667 plus interest on taxes it claims were overpaid on its 1948 and 1949 income, Tennessee Gas Transmission Co., Houston, has filed a suit against the U. S. Government. This refund request stems from differing interpretations of the FPC and the revenue service as to bookkeeping items concerning pipe transactions.

On the rate scene this month, FPC action permitted United Gas Pipe Line Co., of Shreveport, La., to file substitute tariff sheets reducing the amount of a proposed increase from $131,000 annually to $18,000. Also filed were a proposed $5,306,000, or 13.2% increase by New York State Natural Gas Corp., Pittsburgh, and a cost-of-service rate schedule by Indiana Natural Gas Co., Omaha, replacing a previously suspended increase. A hearing to commence Feb. 1 involves a suspended increase of about $5,858,000 for Texas Illinois Natural Gas Pipeline Co., Chicago.

Panhandle to serve glass and chemicals plants

FPC has affirmed the decision's of its presiding examiner Marvin Farrington (docket G-1767 and G-2047) authorizing Panhandle Eastern Pipe Line Co., Kansas City, Mo. to construct facilities for delivery of gas to National Petro-Chemicals Corp.'s plant near Tuscola, Ill. and the Brockway Glass Co. plant near Lapel, Ind.

The decisions authorize Panhandle to deliver, on an interruptible basis up to 7 MMcf of gas a day for fuel in Petro-Chemical's extraction and chemical plant from Sept. 16 through April 15 and up to 24 MMcf daily during the other five months of the year. Operation is limited to a five-year period unless otherwise ordered by FPC. Construction will include a measuring station to cost about $27,000.

The order also allows Panhandle to deliver to Brockway Glass up to 1.5 MMcf on an interruptible basis for a five-year period.

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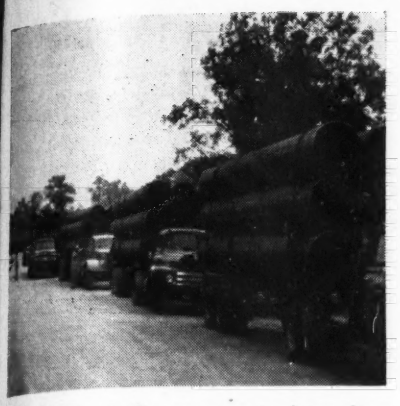

Parkhill Truck Co. caravan is shown here with part of the 30-in. pipe being hauled for the Gulf Interstate Gas Co. line from mills at Houston and Orange, Texas, to storage points in eastern Louisiana and Mississippi, and from mills at Gadsden, Ala. to storage points in Alabama and Mississippi.

Hearing set for Panhandle "show cause" order

Hearing has been set for Jan. 5 on an order (docket G-2035) which FPC issued on its own motion directing Panhandle Eastern Pipe Line Co., Kansas City, Mo. to show cause why it should not be required to sell natural gas to four utilities in the Midwest so they can render service within their franchise areas. Panhandle presently is rendering or is proposing to render this service itself.

The four customer utilities are Citizens Gas Fuel Co., Ardian, Mich.; Citizens Gas Co., Tuscola, Ill.; Michigan Gas Utilities Co., Coldwater, Mich.; and Southeastern Michigan Gas Co., Port Huron, Mich. The commission has already granted temporary authority to Panhandle to serve the Bohn Aluminum & Brass Corp. plant at Adrian through the facilities of Citizens Gas Fuel Co. FPC said its investigation would not interfere with the continuation of this service until final determination of the case.

The commission at the same time reopened, and consolidated with the Jan. 5 hearing, several other proceedings involving the question of whether the company's interruptible rate schedules should be revised.

Notes

The division of refining of the American Petroleum Institute has announced that its new technical abstract service will be inaugurated in January. Designed to save time, money and effort for its subscribers, the new service will cover 100 of the most useful petroleum and chemical publications in a bulletin published weekly. Copies of the abstracted articles will also be available. Sample copies of the bulletin and additional information may be obtained from Louis C. Stork, editor, Technical Abstract Service, American Petroleum Institute, 50 West 50th St., New York 20, N. Y.

Southern Natural Gas Co., Birmingham, has been directed by FPC to establish a connection and supply natural gas to the city of Austell, Ga. (docket No. G-2164). The city will transport and distribute gas to nine communities and adjacent areas in Douglas and Cobb counties, Ga. At an estimated cost of $1.8 million, it will build about 11 miles of line from Southern's system to Lithia Springs and another two miles to the Austell-Clarkdale-Powder Springs area. About 12½ miles of laterals will connect other communities and rural customers.

The FPC has affirmed the decision of Examiner Emery J. Woodall on dockets G-2122 and G-2155 (see November *GAS*, page 113) permitting Arkansas Louisiana Gas Co., Shreveport, to abandon service of approximately 12.5 MMcf of gas per day to Mississippi River Fuel Corp., St. Louis. The commission concurred with Mr. Woodall in the conclusion that discontinuance of service would result in economic benefits to the applicant without adverse affect to Mississippi.

Texas Eastern Transmission Corp., Shreveport, has been granted temporary authorization (docket No. G-2251) to increase its natural gas deliveries to six existing customers, including Manufacturers Light & Heat Co., Pittsburgh, and Ohio Fuel Gas Co., Columbus, under its short-term firm service. The authorization also permits increased deliveries to five customers, including Philadelphia Gas Works, under its winter-peaking service rate schedules. FPC said the authorization was made without prejudice to later disposition of the application.

The FPC has approved Colorado Interstate Gas Co.'s application to sell a maximum of 500 MMcf of gas per year to Kansas-Colorado Utilities Inc., Lamar, Colo. An examiner had earlier ruled the application should be approved and no objections were raised.

Public Service Co. of North Carolina Inc., Gastonia, has received FPC approval to construct pipeline facilities to connect local distributors in 25 North Carolina communities.

The Humble Oil & Refining Co., Austin, in October began payment of the state gathering tax on natural gas. Under protest, it paid $1,205,000 representing taxes owed for 25 months since the levy went into effect. The company had not been paying the tax because it said it could not determine for what gas it should be considered the "gatherer" under the law's definition. The state comptroller said no explanation was made as to why Humble had decided to pay the tax. No suit had been brought because other companies have challenged the validity of the tax and U. S. Supreme Court has not yet passed on the issue.

Authorization has been granted Cities Service Gas Co., Oklahoma City, and Natural Gas Pipeline Co. of America, Chicago, for delivery of gas by one company to the other under conditions of emergency (docket G-1988). The facilities, already constructed under a temporary certificate issued by FPC in July 1952, are located in Ford county, Kan. and include about 2700 ft of 8-in. pipe connecting the two systems. The temporary certificate authorized sale and delivery of 16.5 MMcf of gas per day from Cities Service to Natural through Sept. 30, 1952. The permanent certificate now authorizes operation of the facilities under emergency conditions.

Nevada Natural Gas Pipe Line Co. has placed $1,150,000 of 5% first mortgage pipeline bonds due in 1973 with Mutual Life Insurance Co. of New York. Proceeds will be used to build a new 114-mile line just beginning construction from Topock, Ariz. to a point about 5 miles from Las Vegas, Nev. Initially the line will serve Las Vegas and Henderson areas and several industrial consumers in Clark county, Nevada.

Current Reading

DESIGN OF HOT TAP CONNECTIONS IN HIGH PRESSURE PIPELINES — Prepared by A. J. DelBuono, P. L. Vissat, and Frank S. G. Williams, all of Taylor Forge & Works, for presentation at ASME petroleum division conference held in Houston Sept. 28-30.

The paper presented a review of the forces acting on the branch connections in a pipeline; an analysis of the stress conditions related to such connections; and suggestions for a design approach aimed at keeping the stress levels around branch connections in harmony with the stress levels common in high pressure pipelines. It also discussed various methods of meeting these design requirements through the use of field fabrication with or without manufactured fittings especially designed for the purpose.

In addition, the authors have presented a digest of investigative work done by their company and by others, bearing on the subject.

DIRTY PIPELINE GAS — ITS CAUSE AND CURE IN THE PETROLEUM INDUSTRY — This is a paper prepared by Raymond C. Baird of the Fluor Corp. and presented at the California Natural Gasoline Assn. annual meeting in October.

Gas-cleaning needs for the petroleum pipeline industry are delineated, and methods commonly employed to clean gas as it

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flows from wellhead to retail consumer discussed. The fundamental separation problem is analyzed hypothetically with reference to commonly used gas-cleaning devices.

Experimental difficulties in laboratory and field impeding development of high-pressure gas scrubbers are indicated and a new research tool for measuring the contamination present in high pressure gas lines described. Examples of field data, including photographs of contamination sample obtained by this tool, are presented.

A look is given at the probable future trends in pipeline gas-cleaning requirements for the petroleum industry.

ACCIDENT RATES, 1952—This booklet contains 55 pages of facts and figures covering the 1952 accident experience of all public utilities reporting to the National Safety Council. Among the industries reporting are gas, communications, and electric.

The utilities booklet is one of a series of pamphlets summarizing injury experience of various industries based primarily on accident records of members of the council, but also including records of non-members which report voluntarily.

Pamphlets are 35 cents per copy in quantities 1-99; 29 cents per copy in quantities of 100 or more when purchased by members. Prices to non-members are doubled. They are available from the National Safety Council, 425 N. Michigan Ave., Chicago.

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Pipeline People

Four promotions were announced following the board of directors meeting of Panhandle Eastern Pipe Line Co., Kansas City, Mo. LEITH V. WATKINS and CORWIN H. HINTON, both officers of the company since 1931, were elected vice presidents. D. A. ROBERTSON, formerly assistant controller, was elected controller and R. W. BLAND, former assistant to F. D. Mathias, joins Mr. Mathias as assistant treasurer.

L. V. Watkins
Panhandle

R. G. Williamson
Cooper-Bessemer

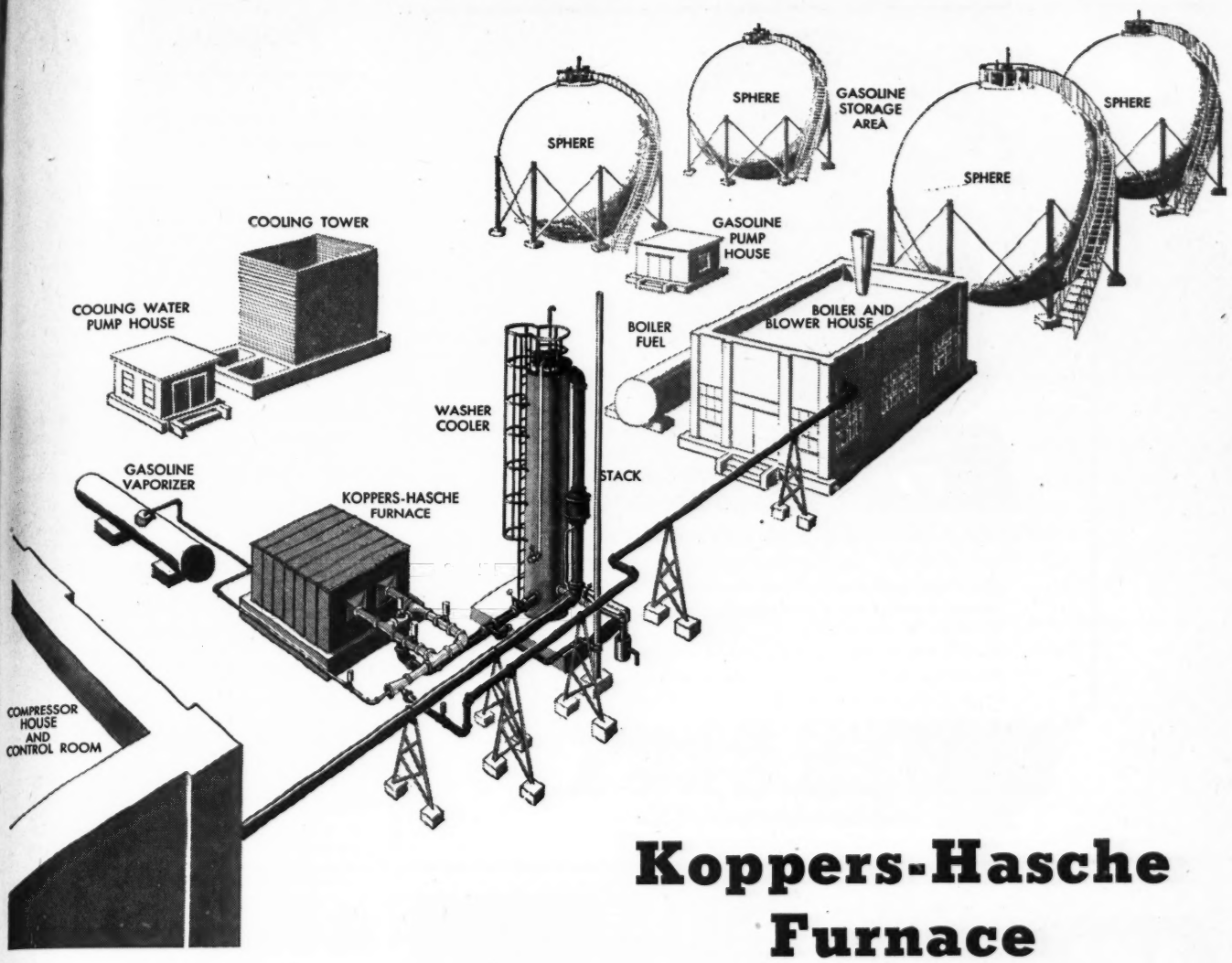
R. G. WILLIAMSON has been appointed branch manager of Cooper-Bessemer Corp.'s Los Angeles district office. Another Cooper-Bessemer employee, JOHN W. HOLMES, an engineer at Mount Vernon, has distinguished himself by making the highest grade in recent examinations given to 712 applicants by the Ohio State Board of Registration for Professional Engineers and Surveyors.

Tube Turns Inc., Louisville, has announced the appointment of two new sales engineers. EARL R. MUIR has been assigned to the Seattle area and RICHARD T. BURKE to the Houston staff. They have been members of the staffs of San Francisco and Midland, Texas, respectively.

Union Producing Co., subsidiary of United Gas Corp., Shreveport, has announced the advancement of D. M. SIMMONS to assistant general superintendent of production; B. J. DOWD to assistant general superintendent of production engineering; C. H. CLAWSON to supervising production engineer for the western division; and BEN F. CARTER to the same position for the eastern division.

FRANK P. SAPONARO has been elected vice president in charge of rate, sales, and regulatory activities of Algonquin Gas Transmission Co. of Boston. Since 1950 he has been manager of rates for Texas Eastern Transmission Corp., Shreveport.

The Tennessee Production Co., Houston, recently announced the election of SAM C. OLIPHANT, Houston, and JAMES NASH, Wichita Falls, as vice presidents. Mr. Oliphant is director of engineering and geology.



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The Hasche Furnace is invaluable in helping utility companies meet peak loads. Also, for industrial plants which use natural gas, as well as for utilities which distribute natural gas, this furnace is always ready to pinch hit in the event of temporary failure of the natural gas supply.

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Extreme simplicity of process makes initial investment low compared to other types of production facilities. Savings are effected not only on furnace cost, but also on auxiliaries. Complete plant is compact, requiring relatively little ground space. Most of the equipment can be installed outdoors, saving cost of protective housing.

Low Operating Cost

Units are entirely automatic in operation, requiring minimum of operating labor and supervision. Few moving parts, thus reducing maintenance.

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You are not limited to the use of propane with a Hasche Plant. Natural gasoline, readily available both winter and summer, is an ideal fuel to augment your natural gas supply.

For further information about the Koppers-Hasche Furnace, phone, write or wire.

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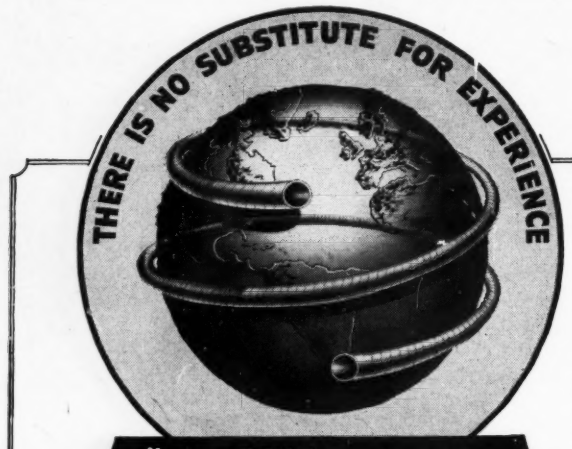

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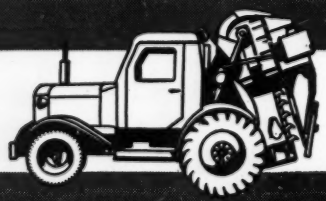

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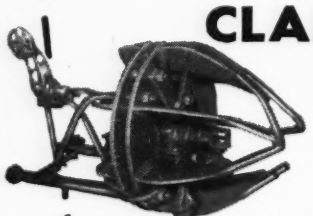

This popular hand-operated internal lineup clamp is designed to give trouble-free operation under all operating conditions. You get perfect alignment and continuous uninterrupted stringer bead that eliminates pinholes and weak welds due to tacking. Costly stringer bead cut-outs due to misalignment are eliminated. Made in 10 sizes for pipe from 12" to 36".

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Progress Reports

NEW CONSTRUCTION PLANNED

AMERICAN LOUISIANA PIPE LINE CO., New York. For construction of 1200-mile, 30-in. line with compressor capacity of 30,000 hp from gas fields near New Orleans to Detroit with connection to Michigan-Wisconsin Pipe Line Co. system near Niles, Mich.

COLORADO INTERSTATE GAS CO., Colorado Springs. Docket G-2269 for 49.5 miles of 20-in. line from Morton county, Kan. to Hooker, Okla.; dehydration plant in Morton county and delivery meter station in Hooker.

NATURAL GAS PIPELINE CO. OF AMERICA, Chicago. Docket G-2282 for 1250-hp compressor unit at Hooker, Okla. station and 2750 ft of 24-in. line connecting station.

TENNESSEE GAS TRANSMISSION CO., Houston. For 243-mile, 24-in. line from Hebron (Pa.) storage field to Greenwich, Conn. Development of four more storage fields—Colden near Buffalo; Harrison and Ellisburg, both in Potter county, Pa., and State Line (N.Y.-Pa.).

TEXAS GAS TRANSMISSION CORP., Owensboro, Ky. For 48 miles of loop between Memphis, Tenn. and Slaughters, Ky. and additional horsepower at one compressor station.

CURRENT CONSTRUCTION

COLORADO INTERSTATE GAS CO., Colorado Springs. Docket G-2120 (1953 program) 49 miles of 20-in. loop line on line near Denver; 30 miles of 12-in. to connect 20-in. with Morton county, Kan. compressor station; 24,860 hp compressor capacity at new and existing stations in Colorado, Oklahoma, Texas, and Kansas. Engineering Construction Co. at work in Kansas. Contracts let to R. H. Fulton & Co. for lines, Fish Engineering Co. and Sterns-Roger on stations. All under way.

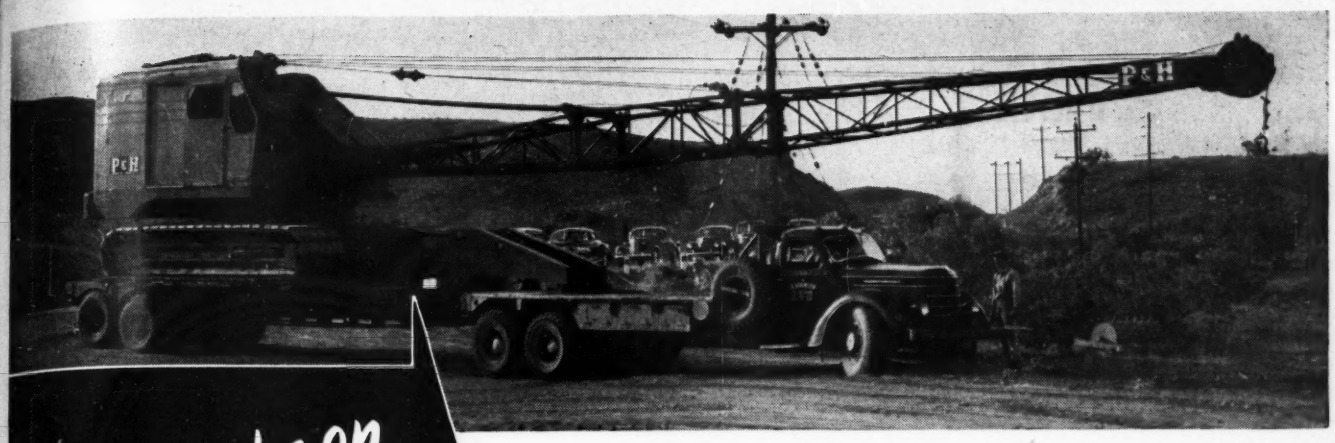
EAST TENNESSEE NATURAL GAS CO., Knoxville. Docket G-1336 for a 100-mile, 16-in. line from near Knoxville to Kingsport, Tenn., with about 58 miles of various sized lateral lines. Contract let to Engineering Construction Co. for 3½ mile Harriman (Tenn.) lateral, and 94 miles of 16-in. line from Topside to Kingsport. Work started Aug. 5, expect completion Jan. 1, 1954.

EL PASO NATURAL GAS CO. Docket G-2106 for total of 1056 miles of line to include about 750 miles of 30-in. and 70 miles of 24-in. mainline with related gathering lines, purification facilities and compressor plants totaling 161,860 hp to carry gas from Permian and San Juan basins. Contractors are Oklahoma Construction Co., R. H. Fulton Co. and company's own crews. Part of facilities scheduled to be in operation by January 1954, remainder by November 1954.

EQUITABLE GAS CO., Pittsburgh. Docket G-2130 to activate the Logansport storage field in the Big Injun Sand, Marion county, W. Va., install a 1320-hp compressor station in Wetzel county, about 9 miles of 12-in. line from storage pool to compressor station, and various 6-in. and 8-in. well connecting lines. Line to be completed this month; compressor station next spring.

GULF INTERSTATE GAS CO., Houston. Docket G-2058 to construct 860 miles of 30-in. line from Rayne, La. to Boyd county, Ky., 229 miles lateral lines and five 8000-hp compressor stations in four states. Mainline contracts let to H. C. Price and Houston Contracting Co. Lateral line contracts let to Anderson Bros., Associated Pipe Line Contractors and Williams Bros. Parkhill Truck Co. hauling pipe. Expect completion Nov. 1, 1954. Over 435 miles of 30-in. line completed. Work begun on 313 miles of gathering lines.

KANSAS-NEBRASKA NATURAL GAS CO. INC., Hastings, Neb. M&R Construction Co. at work



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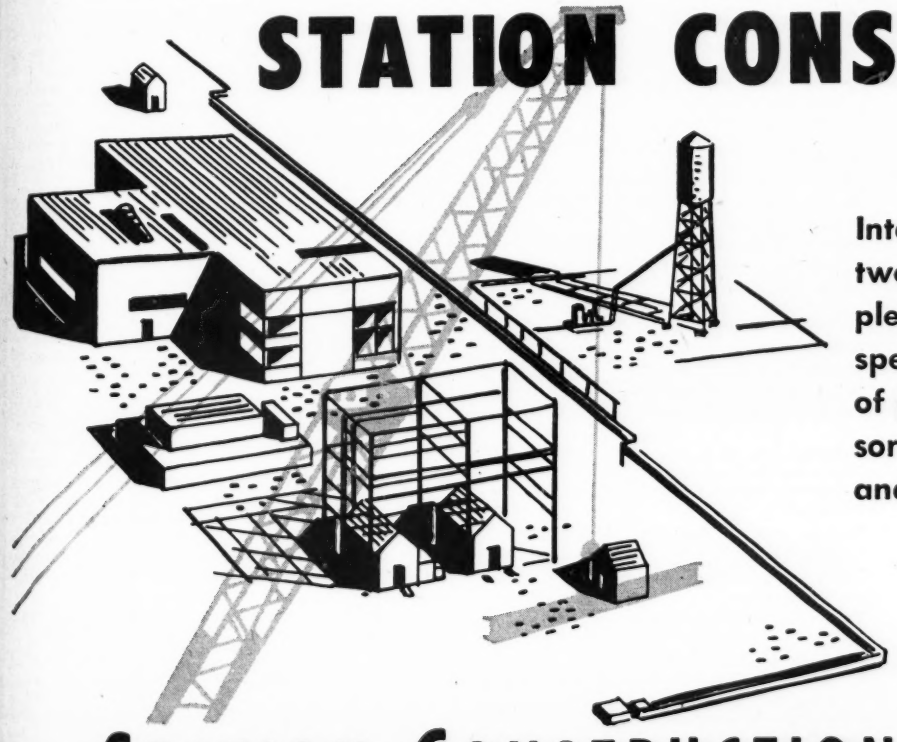

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on 26 miles of 12-in. line from Ogallala to Big Springs, Neb.; Brodie Construction Co. at work on 32 miles of 4-in. to 8-in. gathering lines in Hugoton field, Kan. Ryan Construction Co. at work on 18 miles of 6-in. line from Palco to Hill City, Kan.

LONE STAR GAS CO., Dallas. A 36-mile, 12-in. line from Stamford to Abilene. Expect completion by company crews this month.

MISSOURI PUBLIC SERVICE CO., Warrensburg. Mid-States Construction Co. began work Nov. 15 on 25 miles of 10-in. line from Warrensburg to Clinton.

NEVADA NATURAL GAS PIPE LINE CO., Las Vegas. Docket G-1888 for 110 miles of 10-in. line from Topock, Ariz. to Whitney, Nev., serving Las Vegas and Henderson areas. Contract let to R. H. Fulton Co., Lubbock, Texas. Gas to flow Dec. 20.

NEW YORK STATE ELECTRIC & GAS CORP., Ithaca. Docket G-1999 for total of 49 miles of pipeline; 25 miles 10-in. from DeRuyther to Norwich, N. Y., 24 miles 8-in. from Norwich to Oneonta, N. Y. Rich & Co. at work. Completion expected Dec. 15.

NORTHERN NATURAL GAS CO., Omaha. Docket G-2009 for a 1.4-mile, 8⅝-in. branch line from its Omaha branch line to a proposed regulating station near La Platte in Sarpy county, Neb.

NORTHERN NATURAL GAS CO., Omaha. Docket G-2063 (in part—first year program) for 259 miles of 24- and 30-in. pipe and 50,400 hp in compressor capacity in new and existing stations in Texas, Oklahoma, Kansas, Nebraska and Iowa. Also 106 miles of branch lines and additions to serve Iowa, Minnesota, Nebraska, and South Dakota. G. G. Griffis Inc., R. H. Fulton & Co. and Lone Star Constructors at work on mainline. Compressor work being done by Dresser Engrg. Co., Foor Engrg. Co., H. B. Zachry Co. and Engineers Ltd. Pipeline Co. Completion expected in December.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-2102 to build about 220 miles of 34-in. mainline loops and 2500 hp in compressor capacity on line from Topock, Ariz. to a point near Milpitas, Calif.; and 6.5 miles of line between Milpitas and Irvington, Calif. Work begun by Engineers Ltd. Pipeline Co. south of Kettleman Hills. Completion of 88-mile Kettleman-Arvin section scheduled for April 1954.

PERMIAN BASIN PIPELINE CO., Omaha. Docket G-1928 for 234 miles of line and 54,880 hp in compressor stations to carry gas from Upton, Midland, and Pecos counties, Texas and Lea county, N. M. to connection with 24-in. El Paso Natural line to Dumas, Texas. R. H. Fulton at work on mainline. Fluor Corp. Ltd., Dresser Engrg. Co. and Sterns-Roger Mfg. Co. on compressors. Completion expected in December.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles. Docket G-2104 to build about 73 miles of 30-in. mainline loops and 5280 hp in additional compressor capacity at Blythe on existing line extending from Blythe to Santa Fe Springs, Calif. Work begun Sept. 15 by River Construction Co. on line; Apex Steel Corp. working on compressor plant; Pacific Pipeline Construction Co. coating pipe. Line to be in operation by Jan. 31, 1954.

SOUTHERN COUNTIES GAS CO., Los Angeles. Alex Robertson Co. at work on 12-mile, 16-in. line from San Luis Obispo to Arroyo Grande. Expect completion Dec. 10.

SOUTHERN COUNTIES GAS CO., Los Angeles. Docket G-2182 for 14 miles of 24- and 22-in. pipe from connection with Blythe-Santa Fe Springs line near Brea to Santa Ana. Hood Construction has completed 24-in. line.

SOUTHERN NATURAL GAS CO., Birmingham. Docket G-1907. Total project approved including 792 miles of line and 18,500-hp compressor capacity—about 522 miles of looping on existing system. About 250 miles various size line remaining for construction in 1954. Construction expected to begin March 15.

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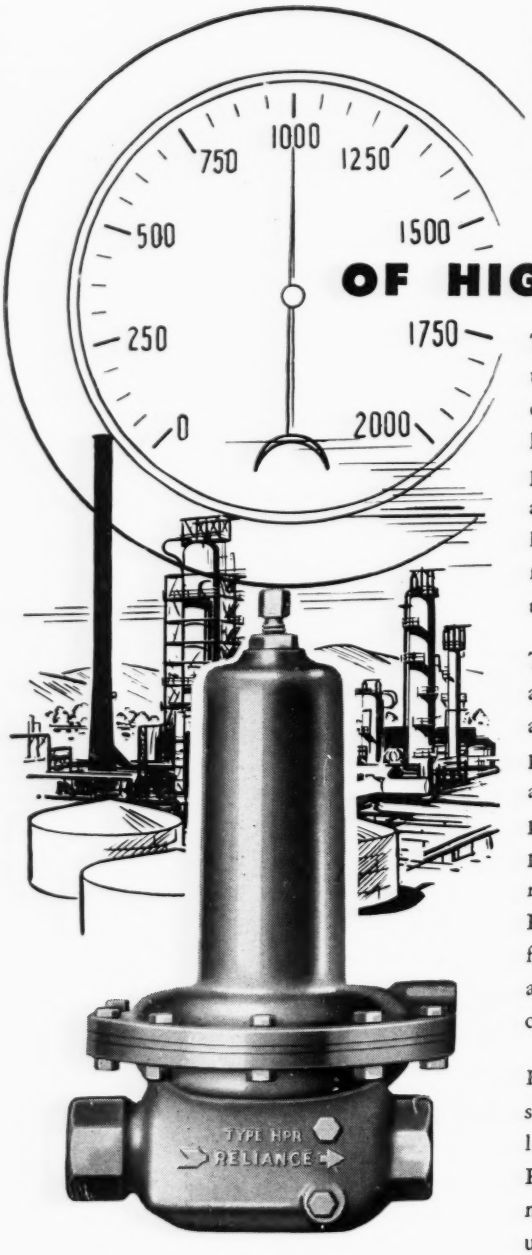

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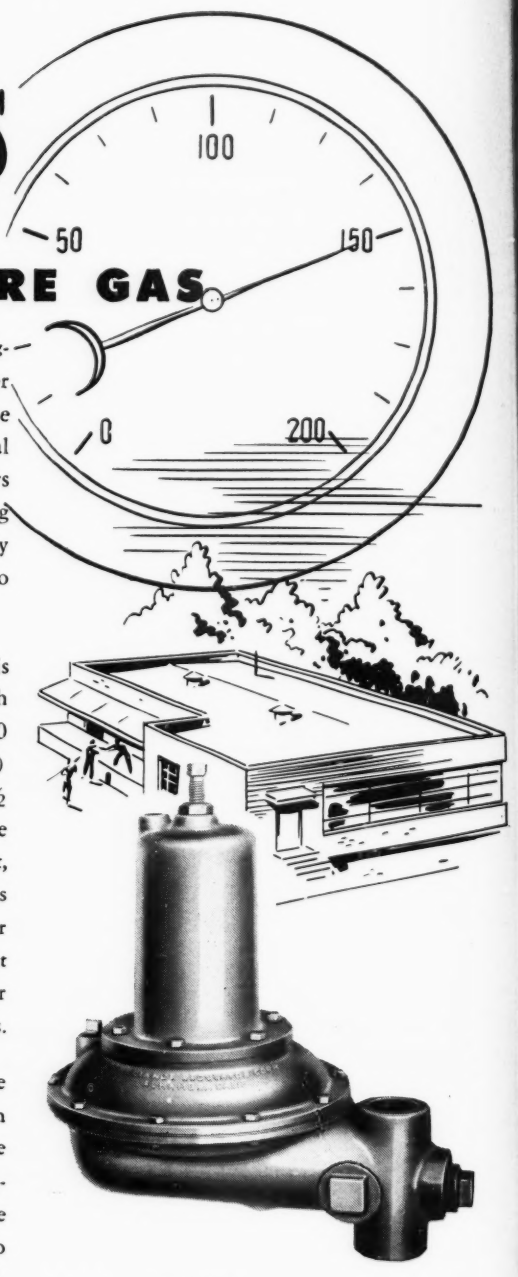

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